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PPPO-02-3218324-16B

Mr. Brian Begley
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Ms. Julie Corkran
U.S. Environmental Protection Agency, Region 4
Federal Facilities Branch
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Atlanta, Georgia 30303

Dear Mr. Begley and Ms. Corkran:

**ADDENDUM TO FINAL CHARACTERIZATION REPORT FOR SOLID WASTE MANAGEMENT UNITS 211-A AND 211-B VOLATILE ORGANIC COMPOUND SOURCES FOR THE SOUTHWEST GROUNDWATER PLUME AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, DOE/LX/07-1288&D2/A1**

Enclosed find for your review and approval the subject document, *Addendum to Final Characterization Report for Solid Waste Management Units 211-A and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1288&D2/A1. The *Addendum* documents results of Regional Gravel Aquifer groundwater sampling in the area of the C-720 Maintenance and Stores Building.

If you have any questions or require additional information, please contact David Dollins at (270) 441-6819.

Sincerely,

Tracey Duncan
Federal Facility Agreement Manager
Portsmouth/Paducah Project Office

Enclosure:
Addendum to the SWMUs 211-A and 211-B Final Characterization Report

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**DOE/LX/07-1288&D2/A1**
**Secondary Document**

# Addendum to the Final Characterization Report for Solid Waste Management Units 211-A and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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**DOE/LX/07-1288&D2/A1**
**Secondary Document**

# Addendum to the Final Characterization Report for Solid Waste Management Units 211-A and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—December 2015

U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
FLUOR FEDERAL SERVICES, INC.,
Paducah Deactivation Project
managing the
Deactivation Project at the
Paducah Gaseous Diffusion Plant
under Task Order DE-DT0007774

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# CONTENTS

# FIGURES



# TABLES

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# ACRONYMS

| | |
|---|---|
| CSM | conceptual site model |
| *Dhc* | *Dehalococcoides mccartyi* |
| DNAPL | dense nonaqueous-phase liquid |
| DOE | U.S. Department of Energy |
| DPT | direct push technology |
| DQO | data quality objective |
| DSS | Decision Support Software |
| EPA | U.S. Environmental Protection Agency |
| EVS-ES | Environmental Visualization Systems Expert System |
| FCR | final characterization report |
| FFS | focused feasibility study |
| GSD | grain size distribution |
| HU | hydrogeologic unit |
| ID | inside diameter |
| KOW | Kentucky Ordnance Works |
| LATA Kentucky | LATA Environmental Services of Kentucky, LLC |
| LCD | Lower Continental Deposits |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| LUC | land use control |
| MCL | maximum contaminant level |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| MW | monitoring well |
| OREIS | Oak Ridge Environmental Information System |
| OU | operable unit |
| PGDP | Paducah Gaseous Diffusion Plant |
| PID | photoionization detector |
| QAPP | quality assurance program plan |
| RDWP | remedial design work plan |
| RDSI | remedial design support investigation |
| RPD | relative percent difference |
| RGA | Regional Gravel Aquifer |
| RI | remedial investigation |
| ROD | record of decision |
| SI | site investigation |
| SWMU | solid waste management unit |
| UCD | Upper Continental Deposits |
| UCRS | Upper Continental Recharge System |
| VC | vinyl chloride |
| VOC | volatile organic compound |
| WAG | waste area group |

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# EXECUTIVE SUMMARY

This Final Characterization Report (FCR) presents the results of the remedial design support investigation (RDSI) for solid waste management units (SWMUs) 211-A and 211-B. Requirements for the RDSI are outlined in the *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, 211-B, Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2012a) (RDWP). The RDSI was performed to better determine the lateral and vertical extent and distribution of volatile organic compounds (VOCs) and source material in the Southwest Plume source areas and to determine soil and groundwater parameters, including geochemical parameters, at each of the SWMUs to be used to design *in situ* bioremediation, if this alternative is selected. Soil sampling focused on soils in hydrogeologic units (HUs) HU1, HU2, HU3, and HU4 within the Upper Continental Deposits (UCD) and previously identified potential trichloroethene (TCE) source areas northeast and southeast of the C-720 Building. The Focused Feasibility Study (DOE 2011) identified a number of alternatives to remediate SWMU 211-A and 211-B, but ultimately concluded that the appropriate alternative would require an RDSI to provide sufficient information as a basis to select a remedial alternative. The selected remedy, as identified in the Record of Decision (ROD) for SWMUs 211-A and 211-B, pending this final characterization of source extent and magnitude, is enhanced *in situ* bioremediation with interim land use controls (LUCs) (Alternative 8) or long-term monitoring with interim LUCs (Alternative 2).

## SWMU 211-A RDSI SUMMARY

Soil samples were collected from 42 boring locations at SWMU 211-A (Figure ES.1). [Note: the RDWP (DOE 2012a) allotted a total of up to 41 planned and contingency soil borings to characterize TCE levels in soil at SWMU 211-A. DOE sampled an additional soil boring to better characterize the extent of the VOC contamination.] Between 12 and 13 soil samples were collected and analyzed at each boring. Grain size distribution (GSD) analysis was performed on select soil samples. Soil sample analytical results, which were used to further evaluate the magnitude and extent of VOCs at SWMU 211-A, are summarized below.

- The average soil boring TCE concentration (based upon the 12 to 13 collected soil samples per soil boring location) was 122 micrograms per kilogram (µg/kg), exceeding the TCE soil remediation goal of 75 µg/kg as identified in the RDWP (DOE 2012a). The maximum individual soil sample TCE concentration detected was 4,800 µg/kg. The areal extent of TCE is defined to the east, west, north, and south.

- Average TCE levels in soil exceeded the remediation goal (75 µg/kg) in 12 of the 42 soil borings (29%). The average TCE level among all samples in these 12 soil borings was 380 µg/kg.[1]

  Using the three-dimensional analysis software Environmental Visualization Systems Expert System (EVS-ES) and a 90% maximum source volume confidence level statistical evaluation, the estimated total TCE volume is approximately 2.2 gal over an areal extent of approximately 34,000 square feet ($ft^2$) area. The area of 90% confidence level that TCE levels exceed 75 µg/kg in part of the soil column extends a maximum of 140 ft in the north-to-south direction (plant coordinate system) and 350 ft in the east-to-west direction (plant coordinate system).

[1] The average TCE level among all samples excludes the lower analysis for depth intervals where duplicate analyses are available and uses one-half of the laboratory reporting limit for “U” qualified analyses.

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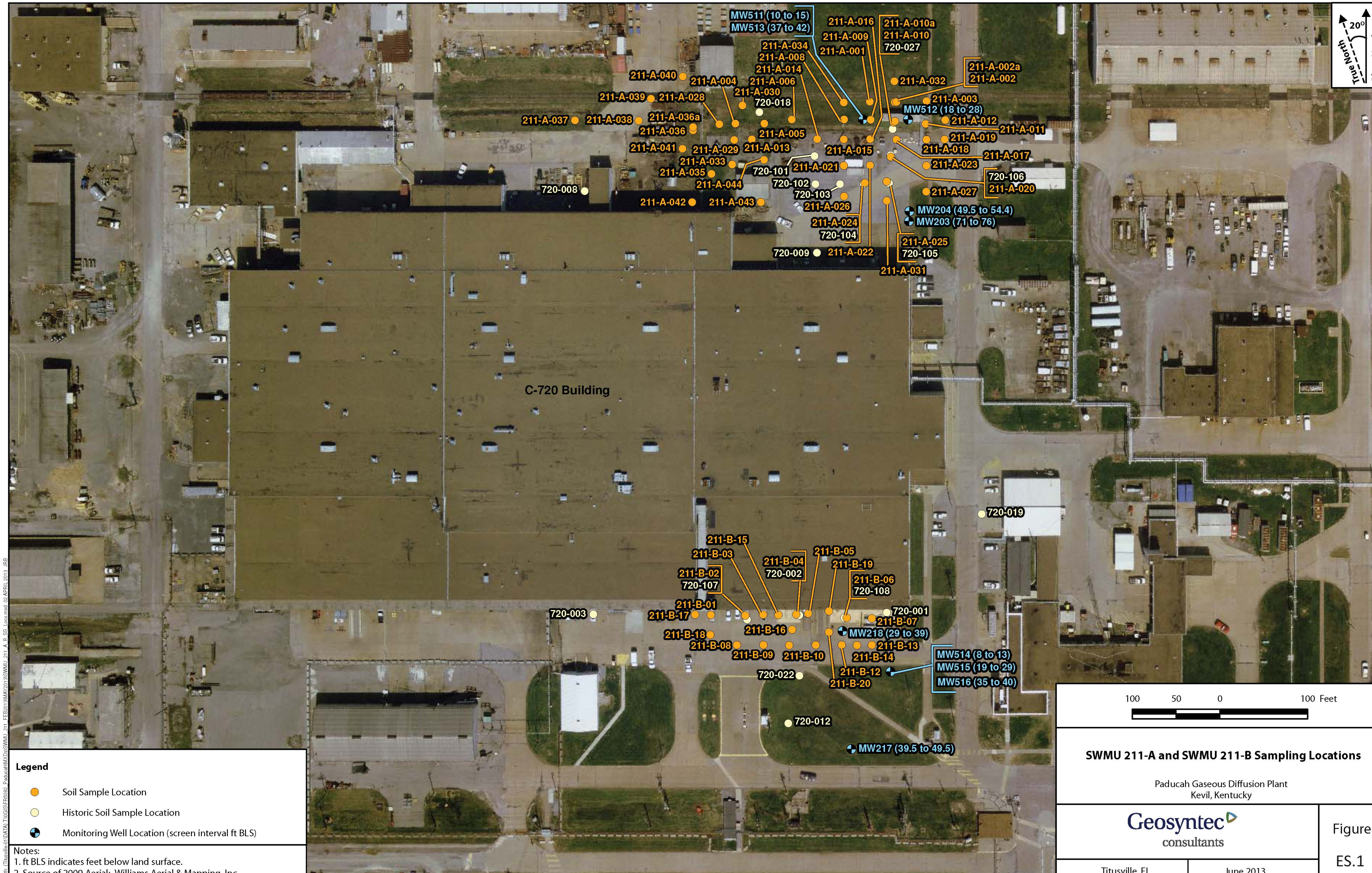


Figure ES.1. SWMU 211-A and SWMU 211-B Sampling Locations

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- 1,1-dichloroethene (1,1-DCE) was the only other VOC to exceed its groundwater protection remediation goal as identified in the RDWP (DOE 2012a). Average 1,1-DCE levels in soil exceeded the remediation goal (137 µg/kg) in 6 of the 42 soil borings (14%).

- The average soil boring 1,1-DCE concentration (based upon the 12 to 13 collected soil samples per soil boring location) among all SWMU 211-A RDSI soil borings was 94 µg/kg. The maximum individual soil sample 1,1-DCE concentration detected was 4,400 µg/kg. 1,1-DCE was primarily detected in the western portion of the 211-A area and may be attributable to a separate historic release of 1,1,1-trichloroethane (1,1,1-TCA) since 1,1-DCE is an abiotic degradation product of 1,1,1-TCA.

- The area of 1,1-DCE levels that exceed 137 µg/kg in part of the soil column is approximately 18,000 $ft^2$, a subset of the area of TCE contamination as defined above and wholly contained within the area of TCE contamination.

- The average soil boring *cis*-1,2-DCE, *trans*-1,2-DCE, and vinyl chloride (VC) concentrations did not exceed their respective soil remediation goals.

- The VOC levels in soil define two discrete areas of greater contaminant levels: an east area of TCE contamination, within and south of the previously identified SWMU 211-A boundary, and a west area of both TCE and 1,1-DCE, outside of the previously identified SWMU 211-A boundary.

Groundwater samples were collected from five monitoring wells (MWs) at SWMU 211-A. Groundwater sample results are summarized in Table ES-1. (Preexisting MWs were sampled three times and RDSI-installed wells were sampled once.) To estimate the total TCE mass in soil and the extent of TCE soil impacts at SWMU 211-A, the RDSI soil TCE data and all historical soil TCE data for the SWMU 211-A investigation area in the Oak Ridge Environmental Information System (OREIS) were interpolated using the software Environmental Visualization Systems Expert System (EVS-ES) and a 90% maximum source volume confidence level statistical evaluation.

LATA Environmental Services of Kentucky (LATA Kentucky) completed an RDSI HU hydrologic analysis to aid in the understanding of injection capacity in the event *in situ* bioremediation is selected as the final remedy for SWMU 211-A. Soil conditions at SWMU 211-A appear to be consistent with the requirements associated with an injection-dependent technology. Flexible wall permeameter tests (ASTM D5084-10) and GSD analyses (ASTM D422) were performed at nine locations. The calculated average hydraulic conductivity values ranged from 5.5E-10 cm/s to 3.8E-7 cm/s. RDSI nested-well injection testing also was performed to assess the hydraulic conductivity of the HU1, HU2, and HU3 formations. The injection testing average hydraulic conductivities were 4.4E-5 cm/s, 1.5E-5 cm/s, and 7.9E-6 cm/s for the HU1, HU2, and HU3 formations, respectively.

**SWMU 211-B RDSI SUMMARY**

Soil samples were collected at 19 boring locations at SWMU 211-B (Figure ES.1). [For reference, the RDWP (DOE 2012a) allotted a total of up to 23 planned and contingency soil borings to characterize TCE levels in soil at SWMU 211-B.] Thirteen soil samples were collected and analyzed at each boring. GSD analysis was performed on select soil samples. Soil sample analytical results that were used to further evaluate the magnitude and extent of VOCs at SWMU 211-B are summarized below.

**Table ES.1. RDSI Groundwater Results (September and October 2012) for all MWs at SWMU 211-A**

| Analyte | Maximum Detected Groundwater Concentration* | | Project Action Limit | MCL | Secondary Standard |
|---|---|---|---|---|---|
| **Total and Dissolved Metals** | | | | | |
| Aluminum (mg/L) | 1.77 | N | 1 | NA | 0.05 to 0.2 |
| Aluminum, dissolved (mg/L) | 0.2 | U | | | |
| Chromium (mg/L) | 0.284 | | 1 | 0.1 | NA |
| Chromium, dissolved (mg/L) | 0.01 | U | | | |
| Iron (mg/L) | 4.99 | | 10 | NA | 0.3 |
| Iron, dissolved (mg/L) | 0.404 | | | | |
| Lead (mg/L) | 0.00308 | | 1 | Zero | NA |
| Lead, dissolved (mg/L) | 0.0013 | U | | | |
| Manganese (mg/L) | 0.282 | N | 1 | NA | 0.05 |
| Manganese, dissolved (mg/L) | 0.248 | X | | | |
| **Volatile Organic Compounds** | | | | | |
| Trichloroethene (µg/L) | 220 | D | 5 | 5 | NA |
| 1,1-Dichloroethene (µg/L) | 810 | D | 7 | 7 | NA |
| *cis*-1,2-Dichloroethene (µg/L) | 29 | | 70 | 7 | NA |
| *trans*-1,2-Dichloroethene (µg/L) | 1 to 10 | U | 100 | 100 | NA |
| Vinyl chloride (µg/L) | 2 to 20 | U | 2 | 2 | NA |
| **Biological (method Quantitative Polymerase Chain Reaction)** | | | | | |
| *Dehalococcoides ethenogenes* (cells/mL) | 43 | U | NA | NA | |
| **Dissolved Gases (method Modified R. S. Kerr SOP-175)** | | | | | |
| Ethane (µg/L): MDL = 0.10 µg/L | 0.41 | | NA | NA | |
| Ethene (µg/L): MDL = 0.025 µg/L | 0.49 | | NA | NA | |
| Methane (µg/L): MDL = 0.025 µg/L | 6.8 | | NA | NA | |
| **Inorganic Anions** | | | | | |
| Chloride (mg/L) | 120 | | NA | NA | 250 |
| Nitrate (mg/L) | 5.4 | | NA | 20 | NA |
| Sulfate (mg/L) | 66 | | NA | NA | 250 |

*Where all analyses are "U" qualified, Table ES.1 reports the laboratory reporting limits. A range is specified where the laboratory reporting limits varied. Laboratory reporting limits for *trans*-1,2-dichloroethene and vinyl chloride reflect a 2X dilution in a sample from MW204 and a 10X dilution in sample from MW513.

**Notes:**
1. µg/L—microgram per liter
2. mg/L—milligram per liter.
3. D—Compounds identified in an analysis at a secondary dilution filter.
4. N—Sample spike recovery not within control limits.
5. U—(inorganics and organics)—Analyte result is less than reporting limit.
6. X—Other specific flags and footnotes may be required to properly define results. For the dissolved manganese analyses, the serial dilution test difference exceeded the quality control limit of 10%.
7. NA—Not available
8. The higher detection limits reported for *trans*-1,2-dichloroethene and vinyl chloride are due to a 10× dilution in one sample.

- The average soil boring TCE concentration (based upon 13 collected soil samples per soil boring location) was 150 µg/kg, exceeding the soil remediation goal of 75 µg/kg. The maximum soil sample TCE concentration detected was 13,000 µg/kg. The areal extent of TCE contaminated soil, accessible by the selected remedies, is defined to the east, west, and south and encompasses an area of approximately 3,000 $ft^2$. Contamination extending under the C-720 footprint (located to the immediate north) is not addressed in this FCR.

- The average TCE concentration exceeded the soil remediation goal of 75 µg/kg at 4 of the 19 boring locations (21%). The average TCE level among all samples in these 4 soil borings was 691 µg/kg.[2]

- The average soil boring 1,1-DCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and VC concentrations did not exceed their respective soil remediation goals.

Groundwater samples were scheduled to be collected from five MWs at SWMU 211-B. MW514 was dry during the field event; therefore, groundwater samples were collected and analyzed from the four remaining MWs. Groundwater sample results are summarized in Table ES.2. [Preexisting MWs were sampled three times and RDSI-installed wells, except for MW514 (which was dry), were sampled once.]

EVS-ES was used to interpolate the RDSI soil TCE concentration data along with historical soil TCE data for the SWMU 211-B investigation area from OREIS and estimate the total TCE mass in soil and the extent of TCE soil impacts at SWMU 211-B, with consideration of a 90% maximum source volume confidence level statistical evaluation. The total estimated TCE volume is 0.8 gal [based upon current areal extent and that the FCR is focusing on contaminated soil accessible by the selected remedies (i.e., no mass interpolated beneath building)]. LATA Kentucky performed an RDSI HU hydrologic analysis to aid the design of remedial injection technologies to be applied at SWMU 211-B. Soil conditions at SWMU 211-B are consistent with the requirements associated with an injection dependent technology. Flexible wall permeameter tests (ASTM D5084-10) and GSD analyses (ASTM D422) were performed at nine locations. The calculated average hydraulic conductivity values ranged from 1.6E-9 cm/s to 3.3E-6 cm/s. RDSI nested-well injection testing also was performed to assess the hydraulic conductivity of HU1, HU2, and HU3 formations. The injection testing average hydraulic conductivities were 6.7E-5 cm/s, 2.0E-5 cm/s, and 2.4E-5 cm/s for HU1, HU2, and HU3 formations, respectively.

## DATA GAPS

The lone Decision Rule from the data quality objectives for the RDSI is as follows:

> If soil boring averaged concentration of TCE and TCE degradation products in soil of the UCRS exceed cleanup levels for a given soil boring, then include the location in the treatment area. If the soil boring-averaged soil concentrations do not exceed cleanup levels, then the area need not be included in the treatment area.

The RDSI fulfilled this requirement to the extent possible.

[2] The average TCE level among all samples excludes the lower analysis for depth intervals where duplicate analyses are available and uses one-half of the laboratory reporting limit for "U" qualified analyses.

**Table ES.2. RDSI Groundwater Results (September and October 2012) for all MWs at SWMU 211-B**

| Analyte | Maximum Detected Groundwater Concentration* | | Project Action Limit | MCL | Secondary Standard |
|---|---|---|---|---|---|
| **Total and Dissolved Metals** | | | | | |
| Aluminum (mg/L) | 8.49 | N | 1 | NA | 0.05 to 0.2 |
| Aluminum, dissolved (mg/L) | 0.281 | | | | |
| Chromium (mg/L) | 0.131 | | 1 | 0.1 | NA |
| Chromium, dissolved (mg/L) | 0.01 | U | | | |
| Iron (mg/L) | 9.79 | | 10 | NA | 0.3 |
| Iron, dissolved (mg/L) | 0.139 | | | | |
| Lead (mg/L) | 0.0106 | | 1 | Zero | NA |
| Lead, dissolved (mg/L) | 0.0013 | U | | | |
| Manganese (mg/L) | 1.43 | | 1 | NA | 0.05 |
| Manganese, dissolved (mg/L) | 0.746 | X | | | |
| **Volatile Organic Compounds** | | | | | |
| Trichloroethene (µg/L) | 120 | | 5 | 5 | NA |
| 1,1-Dichloroethene (µg/L) | 10 | U | 7 | 7 | NA |
| *cis*-1,2-Dichloroethene (µg/L) | 2.2 | | 70 | 7 | NA |
| *trans*-1,2-Dichloroethene (µg/L) | 2 | U | 100 | 100 | NA |
| Vinyl chloride (µg/L) | 4 | U | 2 | 2 | NA |
| **Biological (method Quantitative Polymerase Chain Reaction)** | | | | | |
| *Dehalococcoides ethenogenes* (cells/mL) | 35 | U | NA | NA | |
| **Dissolved Gases (method Modified R. S. Kerr SOP-175)** | | | | | |
| Ethane (µg/L): MDL = 0.10 µg/L | 25 | | NA | NA | |
| Ethene (µg/L): MDL = 0.025 µg/L | 7.9 | | NA | NA | |
| Methane (µg/L): MDL = 0.025 µg/L | 35 | | NA | NA | |
| **Inorganic Anions** | | | | | |
| Chloride (mg/L) | 340 | | NA | NA | 250 |
| Nitrate (mg/L) | 3 | | NA | 20 | NA |
| Sulfate (mg/L) | 40 | | NA | NA | 250 |

*Where all analyses are "U" qualified. Table ES.2 reports the laboratory reporting limits.

**Notes:**
1. µg/L—microgram per liter
2. mg/L—milligram per liter.
3. N—Sample spike recovery not within control limits.
4. U—(inorganics and organics) -Analyte result is less than reporting limit.
5. X—Other specific flags and footnotes may be required to properly define results. For the dissolved manganese analyses, the serial dilution test difference exceeded the quality control limit of 10%.
6. NA—Not available

- The 42 soil borings of SWMU 211-A that were sampled for VOC analyses as part of the RDSI and data from historical soil borings in the area as contained in OREIS delimit the lateral extent of soil contamination of TCE and its degradation products, as defined by the project remediation goals, in all directions.

- At SWMU 211-B, the 20 soil borings that were sampled for VOC analyses as part of the RDSI and data from historical soil borings in the area as contained in OREIS delimit the east, west, and south extent of soil contamination by TCE and its degradation products, as defined by the project remediation goals. The area of soil contamination abuts the C-720 Building. As recognized in the RDWP (DOE 2012a), plant infrastructure and continuing use of the C-720 Building prevent current sampling of the soils beneath the building such that the north extent of the soil contamination cannot be determined at this time.

The available soil data for SWMUs 211-A and 211-B provide a foundation for selection and design of an appropriate remedial alternative.

**DISCUSSION**

This FCR (based on data from the current RDSI as well as the soil sample data from 2004 and other historical data for the investigation areas as available in OREIS) used EVS-ES to contour the 90% confidence limit of 75 µg/kg TCE in soil. The EVS-ES software estimates the TCE source mass within the 90% confidence limit of 75 µg/kg TCE to be approximately 12 kg (2.2 gal) at 211-A and 5 kg (0.8 gal) at 211-B.

The soil and groundwater data collected at SWMU 211-A and SWMU 211-B indicate that natural biodegradation may be occurring, albeit at a relatively slow rate. The presence of methane, ethene, ethane, and *cis*-1,2-DCE, and the absence of VC or measureable *Dehalococcoides mccartyi* are indicative of an environment that appears to have some natural attenuation capacity.

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# 1. PROJECT DESCRIPTION

The U.S. Department of Energy (DOE) has tasked LATA Environmental Services of Kentucky, LLC, (LATA Kentucky) with performing field activities to (1) better determine the lateral and vertical extent and distribution of volatile organic compounds (VOCs) and source material and (2) determine soil and groundwater parameters, including geochemical parameters to be utilized in the design of *in situ* bioremediation, if this alternative is selected for the Upper Continental Deposits (UCD) at Solid Waste Management Units (SWMUs) 211-A and 211-B at the Paducah Gaseous Diffusion Plant (PGDP), located near Paducah, Kentucky (Figure 1). LATA Kentucky has developed this Final Characterization Report (FCR) to document these field activities that are associated with the Remedial Design Support Investigation (RDSI) (DOE 2012a) for the Southwest Plume (Figure 2).

The Southwest Plume refers to an area of groundwater contamination in the Regional Gravel Aquifer (RGA) south of the Northwest Groundwater Plume and west of the C-400 Building. The primary groundwater contaminant of concern for the Southwest Plume is trichloroethene (TCE). Other potential contaminants found in the plume include additional VOCs, metals, and the radionuclide technetium-99.

DOE conducted a site investigation (SI) in 2004 to address uncertainties regarding potential source areas to the Southwest Plume that remained after previous investigations. The SI further profiled the concentration and distribution of VOCs in the dissolved-phase plume along the west plant boundary as documented in the SI report (DOE 2007). The potential presence of dense nonaqueous-phase liquid (DNAPL) TCE at the Southwest Plume source areas has been noted based on contaminant trends observed in soil and groundwater samples.

The potential source areas investigated in the SI (DOE 2007) included the C-747-C Oil Landfarm (Oil Landfarm–SWMU 1); the C-720 Building Area near the northeast and southeast corners of the building (C-720 Northeast Site–SWMU 211-A and C-720 Southeast Site–SWMU 211-B); and the storm sewer system between the south side of the C-400 Building and Outfall 008 (storm sewer–SWMU 102). As a result of the SI, the storm sewer was excluded as a potential VOC source to the Southwest Plume.

A revised focused feasibility study (FFS) (DOE 2011) was prepared to evaluate remedial alternatives for potential application at the Southwest Plume source areas. The revised FFS defined the following remedial action objectives:

1. Treat and/or remove the principal threat waste consistent with the National Contingency Plan.

2a. Prevent exposure to VOC contamination in the source areas that will cause an unacceptable risk to excavation workers (< 10 ft).

2b. Prevent exposure to non-VOC contamination and residual VOC contamination through interim land use controls (LUCs) within the Southwest Plume source areas (i.e., SWMU 1, SWMU 211-A, and SWMU 211-B) pending remedy selection as part of the Soils Operable Unit (OU) and the Groundwater OU.

3. Reduce VOC migration from contaminated subsurface soils in the treatment areas at the Oil Landfarm and C-720 Northeast and Southeast Sites so that contaminants migrating from the treatment areas do not result in the exceedance of maximum contaminant levels (MCLs) in underlying RGA groundwater.

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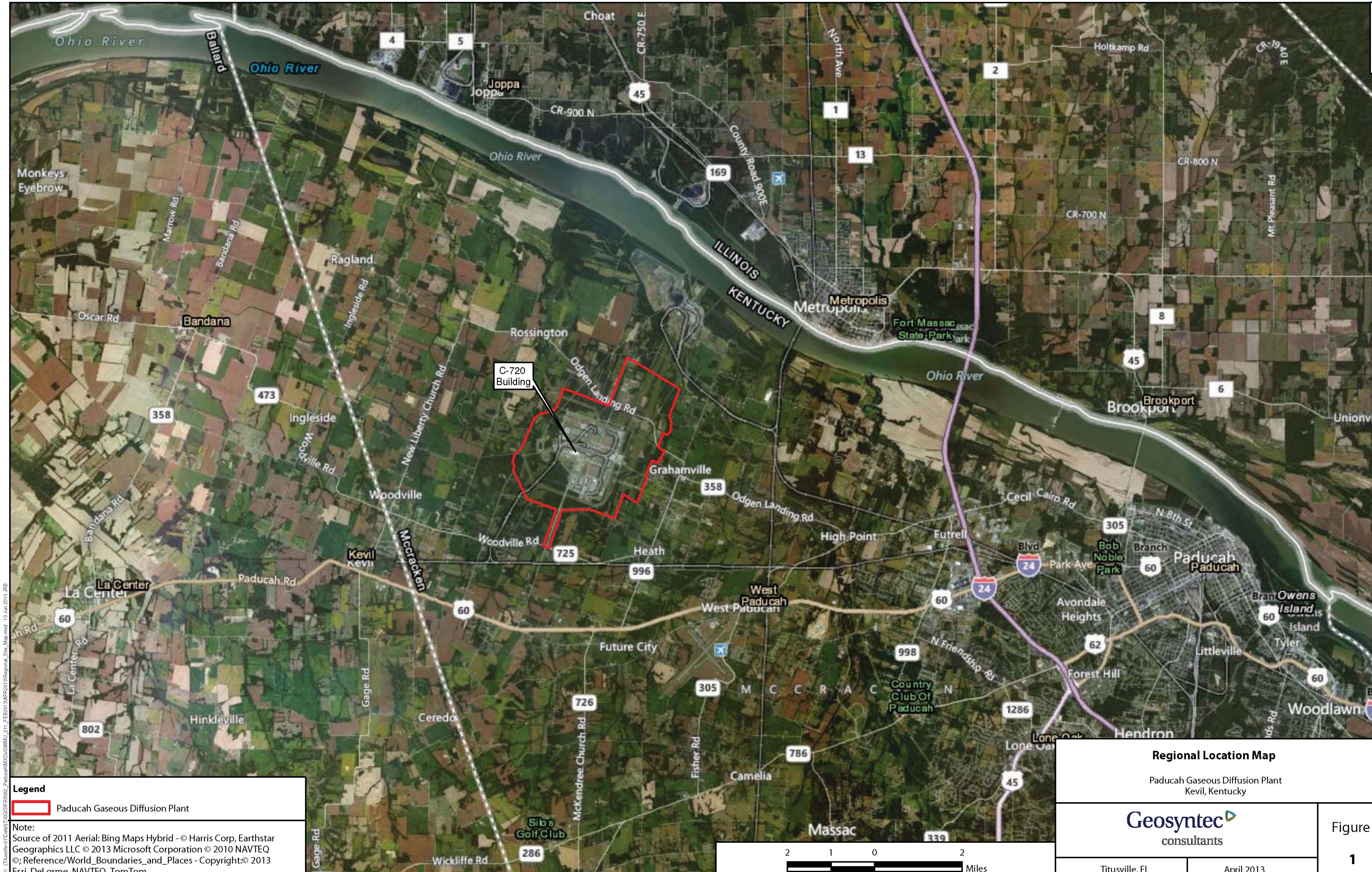


**Figure 1. Regional Location Map**


Figure 2. SWMUs 211-A and 211-B Location Map

The following remediation goals for the Upper Continental Recharge System (UCRS) soils at SWMUs 211-A and 211-B are presented in the record of decision (ROD) (DOE 2012b):

- TCE: 75 µg/kg,
- 1,1-dichloroethene (DCE): 137 µg/kg,
- *cis*-1,2-DCE: 619 µg/kg,
- *trans*-1,2-DCE: 5,290 µg/kg, and
- vinyl chloride (VC): 570 µg/kg.

The selected remedies for SWMUs 211-A and 211-B are identified in the ROD (DOE 2012b), which are *in-situ* source treatment using enhanced *in situ* bioremediation with interim LUCs (Alternative 8) or long-term monitoring with interim LUCs (Alternative 2).

This FCR for SWMU 211-A and 211-B is intended to resolve data needs in support of the treatment system design. Based on the information presented in this a report a recommendation for final remedy selection for SWMUs 211-A and 211-B will be presented to the Federal Facility Agreement parties by a letter notification.

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# 2. SITE BACKGROUND

## 2.1 SITE DESCRIPTION

PGDP is located approximately 10 miles west of Paducah, Kentucky, (population approximately 26,000) and 3.5 miles south of the Ohio River in the western part of McCracken County (Figure 1). The plant is located on a DOE-owned site, approximately 650 acres of which are within a fenced security area, approximately 800 acres are located outside the security fence, and the remaining 1,986 acres are licensed to Kentucky as part of the West Kentucky Wildlife Management Area. Bordering the PGDP reservation to the northeast, between the plant and the Ohio River, is a Tennessee Valley Authority reservation on which the Shawnee Fossil Plant is located. All plant and process water at PGDP is drawn from the Ohio River.

Before the PGDP was built, a munitions-production facility, the Kentucky Ordnance Works (KOW), was operated at the current PGDP location and at an adjoining area southwest of the site. Munitions, including trinitrotoluene, were manufactured and stored at the KOW between 1942 and 1945. Construction of PGDP was initiated in 1951 and the plant began operations in 1952. Construction was completed in 1955 and PGDP became fully operational in that year, supplying enriched uranium for commercial reactors and military defense reactors.

## 2.2 REGIONAL GEOLOGY AND HYDROGEOLOGY

**Regional Geology.** PGDP is located in the Jackson Purchase Region of Western Kentucky, which represents the northern tip of the Mississippi Embayment portion of the Coastal Plain. The Jackson Purchase Region is an area of land that includes all of Kentucky west of the Tennessee River. The stratigraphic sequence in the region consists of Cretaceous, Tertiary, and Quaternary sediments unconformably overlying Paleozoic bedrock. Within the Jackson Purchase Region, strata deposited above the Precambrian basement rock attain a maximum thickness of 12,000 ft to 15,000 ft. Exposed strata in the region range in age from Devonian to Holocene. The Devonian stratum crops out along the western shore of Kentucky Lake.

Mississippian carbonates form the nearest outcrop of bedrock and are exposed approximately 9 miles northwest of PGDP in southern Illinois (MMES 1992). The Coastal Plain deposits unconformably overlie Mississippian carbonate bedrock and consist of the following: the Tuscaloosa Formation; the sand and clays of the Clayton/McNairy Formations; the Porters Creek Clay; and the Eocene sand and clay deposits (undivided Jackson, Claiborne, and Wilcox Formations). Continental Deposits unconformably overlie the Coastal Plain deposits, which are, in turn, covered by loess and/or alluvium.

Relative to the shallow groundwater flow system in the vicinity of PGDP, the Continental Deposits and the overlying loess and alluvium are of key importance. The Continental Deposits resemble a large low-gradient alluvial fan that covered much of the region and eventually buried the erosional topography. A principal geologic feature in the PGDP area is the Porters Creek Clay Terrace, a subsurface terrace that trends approximately east to west across the southern portion of the plant. The Porters Creek Clay Terrace represents the southern limit of erosion or scouring of the ancestral Tennessee River. Thicker sequences of Continental Deposits, as found underlying PGDP, represent valley fill deposits and can be informally divided into a lower unit (gravel facies) and an upper unit (clay facies). The Lower Continental Deposits (LCD) are the gravel facies consisting of chert gravel in a matrix of poorly sorted sand and silt that rests on an erosional surface representing the beginning of the valley fill sequence. In total, the gravel units average approximately 30-ft thick, but some thicker deposits (as much as 50 ft) exist in deeper scour channels. The UCD is primarily a sequence of fine grained, clastic facies varying in thickness from 15 ft to 60 ft that consist of clayey silts with lenses of sand and occasional gravel. The UCRS is comprised of alluvial deposits, which vary considerably in grain size and porosity. Based on geologic logs, the lithology reflects facies changes that range from silt to sand to clay. Some logs indicate clay is present from land surface to the top of the RGA, which confines the aquifer. Other logs indicate there are areas where only silt and sand are present from land surface to the top of the RGA, so the RGA is unconfined in these areas. The RGA receives recharge most readily in the unconfined areas. These areas may serve as pathways for contaminant migration from the UCRS to the RGA.

The area of the Southwest Plume lies within the buried valley of the ancestral Tennessee River in which Pleistocene Continental Deposits (the fill deposits of the ancestral Tennessee River Basin) rest unconformably on Cretaceous marine sediments. Pliocene through Paleocene formations in the area of the Southwest Plume have been removed by erosion from the ancestral Tennessee River Basin. In the area of the Southwest Plume and its sources, the upper McNairy Formation consists of 60 to 70 ft of interbedded units of silt and fine sand and underlies the Continental Deposits. Total thickness of the McNairy Formation is approximately 225 ft.

The surface deposits found in the vicinity of PGDP consist of loess and alluvium. Both units are composed of clayey silt or silty clay and range in color from yellowish-brown to brownish-gray or tan, making field differentiation difficult.

**Regional Hydrogeology.** The local groundwater flow system at the PGDP site occurs within the sands of the Cretaceous McNairy Formation, Pliocene terrace gravels, Plio-Pleistocene lower continental gravel deposits and upper continental deposits, and Holocene alluvium (Jacobs EM Team 1997; MMES 1992). Four specific components have been identified for the groundwater flow system and are defined as follows from lowest to uppermost.

- McNairy Flow System. Formerly called the deep groundwater system, this component consists of interbedded sand, silt, and clay of the Cretaceous McNairy Formation. Sand facies account for 40% to 50% of the total formation’s thickness of approximately 225 ft. Groundwater flow is predominantly north.

- Terrace Gravel. This component consists of gravel deposits and later reworked sand and gravel deposits found at elevations higher than 320 ft above mean sea level (amsl) in the southern portion of the plant site; they overlie the Paleocene Porters Creek Clay and Eocene sands and are thought to be Pliocene in age. These deposits usually lack sufficient thickness and saturation to constitute an aquifer. Terrace Gravel is not present in the area of the Southwest Plume sources.

- RGA. This component consists of the Quaternary sand and gravel facies of the LCD and Holocene alluvium found adjacent to the Ohio River and is of sufficient thickness and saturation to constitute an aquifer. These deposits are commonly thicker than the Pliocene(?) gravel deposits, having an average thickness of 30 ft, and range up to 50 ft in thickness along an axis that trends east-west through the plant site. Prior to 1994, the RGA was the primary aquifer used as a drinking water source by nearby residents. The RGA has not been formally classified, but likely would be considered a Class II groundwater under U.S. Environmental Protection Agency (EPA) Groundwater Classification guidance (EPA 1986). Groundwater flow is predominantly north toward the Ohio River.

- UCRS. Formerly called the shallow groundwater system, the UCRS consists of the surficial alluvium and UCD. Sand and gravel lithofacies appear relatively discontinuous in cross-section, but portions may be interconnected. The most prevalent sand and gravel deposits occur at an elevation of approximately 345 to 351 ft amsl; less prevalent deposits occur at elevations of 337 to 341 ft amsl.

Groundwater flow is predominantly downward into the RGA from the UCRS, which has a limited horizontal component in the vicinity of PGDP.

The groundwater flow systems associated with the Southwest Plume and its sources are the UCRS and the RGA. In the area of the Southwest Plume, groundwater flow and contaminant migration through the upper 45 ft to 55 ft of subsurface soil (UCD) is predominantly downward with little lateral spreading. This flow system is termed the UCRS. Locally, the UCRS consists of three hydrogeologic units (HUs), an upper silt interval (HU1), an intermediate horizon of sand and gravel lenses (HU2), and a lower silt and clayey silt interval (HU3). Groundwater flow rates in the UCRS tend to be on the order of 0.1 ft per day (ft/day). The silts and clays of the UCRS readily adsorb some contaminants, such as many metals and radionuclides, retarding the migration of these contaminants in groundwater from the source areas. Moreover, laterally extensive silt and clay horizons in the UCRS may halt the downward migration of DNAPLs, but foster the development of DNAPL pools in the subsurface.

Groundwater occurrence in the UCRS is primarily the result of infiltration from natural and anthropogenic recharge. Flow is predominantly downward. Groundwater in the UCRS provides recharge to the underlying RGA. The water table in the UCRS varies both spatially and seasonally due to lithologic heterogeneity and recharge factors (e.g., infiltration of focused run-off from engineered surfaces, seepage due to variations in cooling water line integrity, rainfall and evapotranspiration), and averages approximately 17 ft in depth with a range of 2 to 50 ft.

Downward vertical hydraulic gradients generally range from 0.5 to 1 ft per ft where measured by monitoring wells (MWs) completed at different depths in the UCRS. MWs in the south-central area of PGDP (south of the C-400 Building and east of the C-720 Building) have lower water level elevations than MWs in other areas of the plant (DOE 1997). Horizontal hydraulic conductivity of the UCRS sand units has been determined from numerous slug tests in a previous investigation (CH2M HILL 1992). The measured hydraulic conductivity of the UCRS sands was 3.5E-05 centimeters per second (cm/s) at SWMU 1 and 3.4E-05 cm/s at the C-720 Building (1.4E-05 and 1.3E-05 inches/second). Measurements of the vertical hydraulic conductivity of the UCRS silt and clay units are not available for either SWMU 1 or the C-720 Building; measurements of the vertical hydraulic conductivity of UCRS silt and clay units on-site range between 1.7E-08 and 2.1E-05 cm/s (6.7E-09 and 8.2E-06 in/s) (DOE 1997; DOE 1999). (The depth-averaged vertical hydraulic conductivity of the total UCRS interval is approximately 1E-06 cm/s [3.9E-07 in/s].)

A thick interval of late Pleistocene sand and gravel from a depth interval of 60 to 90 ft (LCD) represents the shallow, uppermost aquifer underlying most of PGDP, referred to as the RGA. The RGA consists of a discontinuous upper horizon of fine to medium sand (HU4) and a lower horizon of medium to coarse sand, and gravel (HU5). The RGA is the main pathway for lateral flow and dissolved contaminant migration off-site. Variations in hydraulic conductivity and the location of discrete sources of recharge govern the local direction and rate of groundwater flow; however, overall flow within the RGA trends north-northeast toward the Ohio River, which represents the regional hydraulic base level.

The RGA typically has a high hydraulic conductivity with a range from 1.9E-02 to 2.0E+00 cm/s (7.5E-03 to 7.9E-01 in/s) as determined from aquifer testing. RGA horizontal hydraulic gradients range between 1.84E-04 and 2.98E-03 ft/ft and have average and median values of 7.81E-04 and 4.4E-04 ft/ft, respectively. Groundwater flow rates within the RGA average approximately 1 to 3 ft/day. Contaminant migration tends to be less retarded in the coarse sediments of the RGA due to its high groundwater flow rate and also due to the low fraction of organic carbon (0.02%).

## 2.3 STUDY AREA GEOLOGY AND HYDROGEOLOGY

**Study Area Geology.** The geologic strata found in the C-720 Building Area range from clays to silts to sands. Silt and clay are the predominant subsurface soil texture to a depth of 15 to 20 ft. Interbedded sand and clay units are commonly found below those depths. Clay and sandy clay/clayey sand are present near the bottom of most of the soil borings northeast of C-720 Building (DOE 2007).

Immediately southeast of the C-720 Building silt and clay are present to a depth of 15 ft with interbedded sand and clay layers found at deeper horizons. Medium-to-coarse-grained sand, suggestive of the contact between the UCD and LCD, was encountered near the bottom of borings in the southeast corner.

**Study Area Hydrogeology.** The Southwest Plume SI included soil sampling within the upper 60 ft of SWMU 211-A and 211-B. Soil samples verified the presence of the HU1, HU2, and HU3 members of the UCRS. The UCRS is comprised of alluvial deposits, which vary considerably in grain size and porosity. Based on geologic logs, the lithology reflects facies changes that range from silt to sand to clay. Some logs indicate clay is present from land surface to the top of the RGA, which confines the aquifer. Other logs indicate there are areas where only silt and sand are present from land surface to the top of the RGA, so the RGA is unconfined in these areas. The RGA receives recharge most readily in the unconfined areas. These areas may serve as pathways for contaminant migration from the UCRS to the RGA. HU3 sediments tended to be coarser grained than typical. The RGA was not encountered, although the final interval sampled 55 to 60 ft often revealed a noticeable increase in grain size and a significant increase in moisture content, consistent with trends near the top of the RGA.

## 2.4 CONTAMINANT HISTORY

The Southwest Plume refers to an area of groundwater contamination at PGDP in the RGA that is south of the Northwest Groundwater Plume and west of the C-400 Building. The Southwest Plume was identified during the Waste Area Grouping (WAG) 27 Remedial Investigation (RI) (DOE 1999). Additional work to characterize the plume (SWMU 210) was performed as part of the WAG 3 RI (DOE 2000a) and Data Gaps Investigations (DOE 2000b). The Southwest Plume SI (DOE 2007) evaluated potential source areas of contamination to the Southwest Plume and profiled the level and distribution of VOCs in the plume along the west plant fence line.

The C-720 Building is located in the southwest area of the PGDP, southwest of the C-400 Building (Figure 2). The C-720 Building consists of several repair and machine shops, as well as other support operations. The WAG 27 RI identified areas of TCE contamination at the C-720 Building Area. One area was underneath the parking lot and equipment storage area at the northeast corner of the building. The second area was located underneath the parking lot adjacent to the loading docks at the southeast corner of the building.

**C-720 Northeast Site (SWMU 211-A) Source.** Contamination found to the northeast of the C-720 Building is believed to have been released during routine equipment cleaning and rinsing performed in the area. Solvents were used to clean parts, and the excess solvent may have been discharged on the ground; additionally, spills and leaks from the cleaning process may have contaminated surface soils in the area. Solvents may have migrated as dissolved contamination, as rainfall percolating through the soils and migrating to deeper soils and the shallow groundwater, or as DNAPL migrating to adjacent and underlying soils.

**C-720 Southeast Site (SWMU 211-B) Source.** The source of VOC contamination found southeast of the C-720 Building is not certain. The VOCs found in this area may have originated from spills that occurred within the building, with subsequent discharge to storm drains leading to the southeast corner of the building or from spills or leaks on the loading dock or parking lot located to the southeast of the building. The area of concern discovered during the WAG 27 RI is near the outlet to one of the storm drains for the east end of the building. A storm sewer inlet for the southeast parking lot also is located in the vicinity. The north edge of the parking lot, where the contamination occurs, is the location of one of the loading docks for the C-720 Building, an area where chemicals, including solvents, may have been loaded or unloaded.

## 2.5 CONCEPTUAL SITE MODELS

The C-720 Building is a maintenance and machine shop facility that has supported PGDP activities since 1952. It is located in the southwest portion of the plant. The area around the east end of the C-720 Building is covered mostly by concrete or asphalt with intermittent small areas of exposed soil. Both the Northeast and Southeast sites contain multiple utilities that influence the types of subsurface intrusive activities that are feasible in those areas.

For the source zones comprised of high concentration TCE soils and other VOCs at the C-720 sites, the primary pathway of contaminant migration is dissolution of contaminant residual, comprised of TCE and other VOCs, into groundwater in the UCRS and downward migration into the RGA. No lateral migration in the UCRS outside the SWMU area has been identified or is expected since vertical flow is the predominant direction of migration for the TCE contaminant. Dissolved contaminants from these sources subsequently migrate toward the west-northwest in the RGA. The much lower hydraulic conductivity of the McNairy Formation underlying the RGA limits vertical migration of dissolved contamination below approximately 100 ft. Groundwater samples from the RGA in the Southwest Plume support the conclusion that the Southwest Plume has not migrated beyond the DOE property line, which is approximately 4,789 ft northwest of the C-720 Building area. From the point where the groundwater flow path that includes the Southwest Plume crosses the DOE property line, the modeled particle flow path distance to potential points of exposure to RGA groundwater near the Ohio River is approximately 4.0 miles. Currently, there is no uncontrolled exposure to groundwater at PGDP. At this time, exposure to contaminated groundwater off DOE property is hypothetical because the DOE Water Policy controls its use. Figure 3 illustrates the conceptual site model (CSM) for the C-720 Building TCE source area.

**C-720 Northeast Site (SWMU 211-A) CSM.** The suspected source of contamination for the Northeast site is from a spill(s) of TCE that occurred during routine equipment cleaning and rinsing performed in the area. The suspected spill location(s) is to the north of the adjacent concrete and asphalt parking and maintenance area west of Eighth Street. The maximum TCE concentration detected in soil (8,100 µg/kg) in the WAG 27 RI was in a sample 30 ft below ground surface (bgs)/344.39 ft amsl in boring 720-027 (sample ID 720027SA030), located immediately north of the parking lot. The WAG 27 RI and subsequent Southwest Plume SI results show soil TCE levels are variable throughout the UCRS. The source of 1,1-DCE, found co-mingled with TCE in the soils of the west end of the area of SWMU 211-A contamination, is unknown.

**C-720 Southeast Site (SWMU 211-B) CSM.** The suspected source of contamination for the Southeast site is located below and adjacent to the outlet for the storm drain on the east end, south side of the C-720 Building, and/or a nearby storm sewer inlet for the parking lot. The southeast corner of the building has a parking lot and a material loading and unloading dock adjacent to it. The highest concentration of TCE in soil samples (68,000 µg/kg) in the WAG 27 RI and subsequent Southwest Plume SI were found at 20 ft bgs (351.80 ft amsl) in soil boring 720-002 (sample ID 7200002SA020), beneath the concrete and asphalt-covered southeast parking lot and adjacent to the intersection of a buried storm water drain issuing from the facility and a main storm-water sewer line on the south side of the C-720 Building.

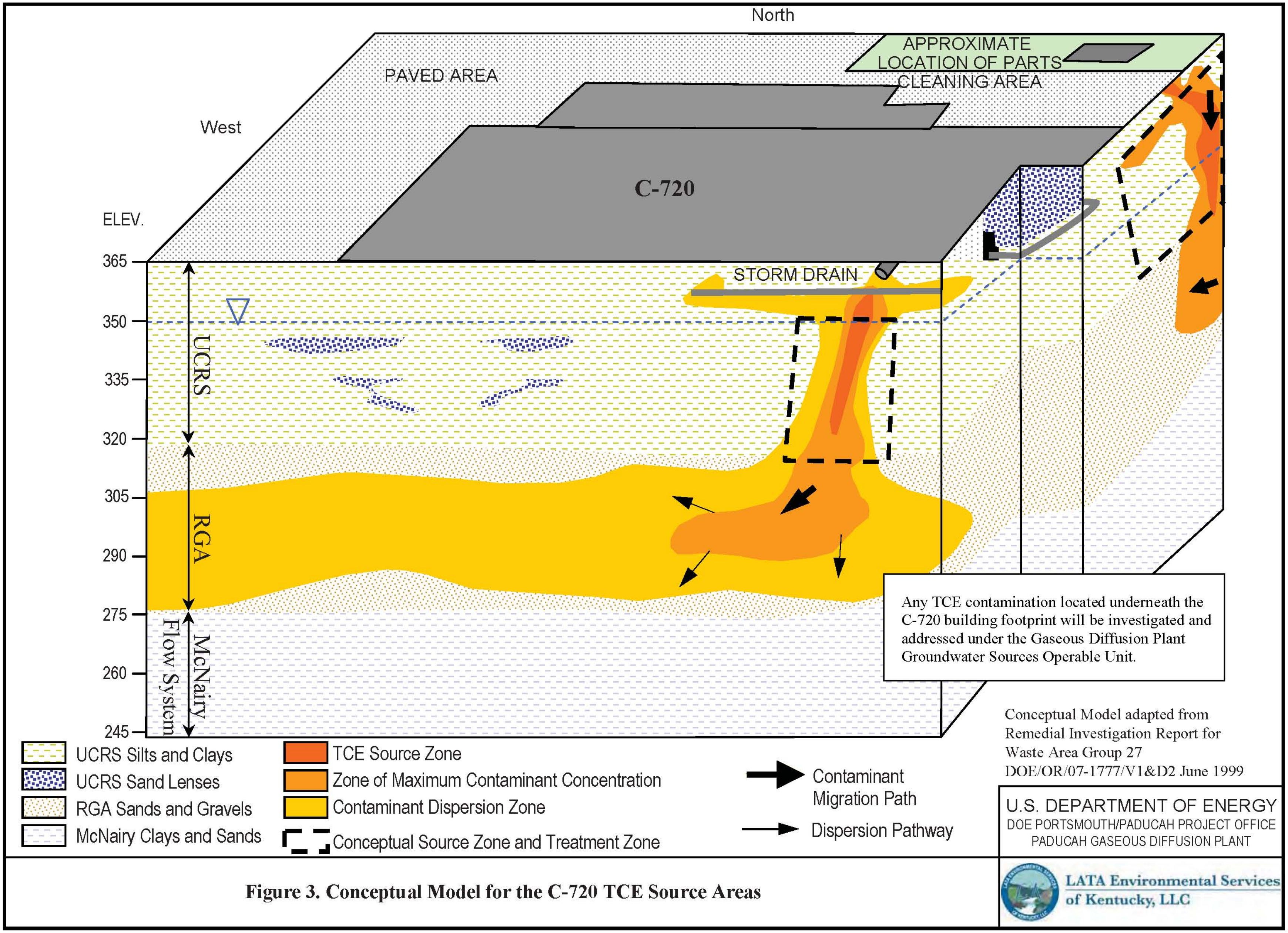


**Figure 3. Conceptual Model for the C-720 TCE Source Areas**

These storm water lines eventually discharge through Outfalls 008 and 009 to Bayou Creek. The interval of contaminated soils extends from the base of the storm sewer (5-ft depth) to the base of the UCRS (60-ft depth). The WAG 27 RI and subsequent Southwest Plume SI results show soil TCE levels are variable throughout the UCRS.

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# 3. DATA QUALITY OBJECTIVES

This FCR implemented the seven-step data quality objectives (DQO) process as summarized in the remedial design work plan (RDWP) (DOE 2012a) to ensure that sufficient data of the appropriate type and quality are collected to resolve the data needs identified previously. The DQO process is a series of logical steps that guides managers or staff to a plan for the resource-effective acquisition of environmental data. The DQO process is used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study.

The DQO process includes systematic planning for environmental data collection. This step is based on the widely accepted "scientific method" and includes concepts such as objectivity of approach and acceptability of results. The DQO process consists of seven iterative steps. Since it is an iterative process, one or more of these steps may be revisited as more information is obtained. The first five steps are focused on identifying qualitative criteria such as the nature of the problem, conceptual model, decisions that need to be made, type of data needed, and the analytic approach or decision rule that describes how the data will be used to draw conclusions. The sixth step establishes acceptable quantitative criteria (acceptance criteria) on the quality and quantity of the data to be collected. The seventh step involves a data collection design to generate data that will meet the quantitative and qualitative criteria specified in step 6. The data collection design specifies the type, number, location, and physical quantity of samples and data and quality assurance/quality control measures.

The DQO process as applied to data collection in support of decision making is summarized here:

(1) **State the Problem**, wherein the problem to be resolved by the data collection activity is sufficiently defined that the focus of the study will be unambiguous.

(2) **Identify the Decision**, wherein the principal study question that the study will try to resolve is defined. An output of this step is a decision statement that links the principal study question to possible actions that will solve the problem.

(3) **Identify Inputs to the Decision**, which identifies informational inputs required to resolve the decision statement and determine which inputs require environmental measurements.

(4) **Define the Study Boundaries**, which defines the spatial and temporal boundaries of the problem.

(5) **Develop a Decision Rule**, wherein the environmental measurement parameter of interest, the action level, and inputs from previous steps are formulated in a single statement that describes a logical basis for choosing among alternative actions. An output of this step is an "If…then…" statement that defines conditions that would cause the decision maker to choose among alternative actions.

(6) **Specify Limits on Decision Errors**, wherein the decision makers' tolerable limits on decision errors are used to establish performance goals for the data collection design.

(7) **Optimize the Design for Obtaining Data**, wherein an efficient strategy for obtaining data that satisfy the DQOs is identified.

These steps in the DQO process, as they apply to C-720 Northeast and Southeast Sites, are shown in Table 1. The DQO process was conducted for SWMUs 211-A and 211-B and for SWMU 1. Accordingly,

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**Table 1. Summary of the DQO Process for the Southwest Plume Source Areas RDSI**
[Table A.2 of the Remedial Design Work Plan (DOE 2012a)]

| 1. State the Problem | 2. Identify the Decision | | | 3. Identify Inputs to the Decision | 4. Define the Study Boundaries | 5. Develop a Decision Rule | 6. Specify Limits on Decision Errors | 7. Optimize the Design for Obtaining Data |
|---|---|---|---|---|---|---|---|---|
| | **Principal Study Questions** | **Alternative Actions** | **Decision Statement** | | | | | |
| **Problem Statement:**<br>The PGDP's Southwest Plume consists of groundwater in the RGA contaminated primarily with TCE. The C 747-C Oil Landfarm (SWMU 1) and the C 720 Building Northeast and Southeast Sites (SWMUs 211-A and 211-B, respectively) are sources of contamination to the Southwest Plume. A revised FFS (DOE 2011a) was performed for the three Southwest Plume source areas. These are defined in the Southwest Plume FFS:<br>(1) Treat and/or remove principal threat waste consistent with CERCLA and the National Contingency Plan.<br>(2) (a) Prevent exposure to VOC contamination in the source areas that will cause an unacceptable risk to excavation workers (< 10 ft depth bgs).<br>(b) Prevent exposure to non-VOC contamination and residual VOC contamination through interim land use controls (LUCs) within the Southwest Plume source areas (i.e., SWMU 1, SWMU 211 A, and SWMU 211 B), pending remedy selection as part of the Soils OU and the Groundwater OU.<br>(3) Reduce VOC migration from contaminated subsurface soils in the treatment areas at the Oil Landfarm and C-720 Northeast and Southeast sites so that contaminants migrating from the treatment areas do not result in an exceedance of MCLs in underlying RGA groundwater.<br>Soil cleanup levels, soil boring-averaged TCE UCRS soil concentrations that would meet RAO #3, calculated in the Southwest Plume Revised FFS Appendix C, are listed below:<br>• Oil Landfarm source area 7.3E-02 mg/kg.<br>• C-720 northeast and southeast source areas 7.5E 02 mg/kg.<br>Previous investigations documented in the WAG 27 RI (DOE 1999) and the SI Report (DOE 2007) did not completely define the areal and vertical extent of soil contaminated above cleanup levels in the source areas. This was identified in the Southwest Plume FFS (DOE 2011a) as a data gap to be resolved in the RDSI.<br>The Southwest Plume Proposed Plan (DOE 2011b) identified *In Situ* Source Treatment Using Deep Soil Mixing with Interim LUCs (Alternative 3) as the preferred alternative for the C-747-C Oil Landfarm and Final Characterization of source extent and magnitude followed by either *In Situ* Source Treatment Using Enhanced *In Situ* Bioremediation with Interim LUCs (Alternative 8) or Long-term Monitoring with Interim LUCs (Alternative 2) as the preferred alternatives for the C-720 Northeast and Southeast Sites. The RDSI will be performed at the Oil Landfarm and Building C-720 to determine better the lateral and vertical extent and distribution of VOCs and source material. The investigation will determine soil and groundwater parameters including geochemical parameters at each of the SWMUs. The extent and distribution of VOCs in the UCRS and upper RGA will impact the design of each remedial alternative. Results from the RDSI will guide decisions regarding the spacing, locations, and depths of augered areas at SWMU 1 and be utilized to design *in situ* bioremediation at SWMU 211, if this alternative is selected. | PSQ-1: What is the areal extent of TCE and TCE degradation products present at soil boring-averaged concentrations higher than cleanup levels at the Southwest Plume source areas?<br>PSQ-2: What are the SWMU-specific ranges of geotechnical and microbial properties that are important to the design of the remedial actions? | AA-1a: Remediation is required where the soil boring-averaged concentrations of TCE and TCE degradation products in soils of the UCRS exceed cleanup levels.<br>AA-1b: Remediation is not required where the soil boring-averaged concentrations of TCE and TCE degradation products in soils of the UCRS do not exceed cleanup levels. | DS-1: Determine the extent of soil boring-averaged concentrations of TCE and TCE degradation products in soils of the UCRS and upper RGA in the Southwest Plume source areas that exceed cleanup levels and require remediation.<br>DS-2: Determine where additional design-type information is required for the preferred alternatives. | (1) Process knowledge of releases (DOE 2011a).<br>(2) Previous investigation results (DOE 2011a).<br>(3) Description of C 720 source areas in Appendix C of the GWOU FS (DOE 1999).<br>(4) Site conceptual model (DOE 2011a).<br>(5) Southwest Plume FFS Alternatives 2, 3, and 8 descriptions (DOE 2011a).<br>(6) Minimum TCE cleanup levels: 7.3E-02 mg/kg for the C-747-C Oil Landfarm and 7.5E-02 mg/kg for the C-720 Northeast and Southeast Sites (DOE 2011a).<br>(7) TCE DLs by USEC = 5E-03 mg/kg (Watson 2010).<br>(8) Current estimates of source area dimensions shown in Southwest Plume FFS (DOE 2011a).<br>(9) Information requirements for design of the preferred alternatives as follows:<br>- Soil properties common to both soil mixing and *in situ* bioremediation—fraction organic carbon, and grain size.<br>- Soil properties specific to soil mixing—*in situ* water content, pH, unconfined compressive strength, compressibility, and index properties.<br>- Soil properties specific to *in situ* bioremediation—permeability<br>- Groundwater properties needed to assess *in situ* bioremediation—alkalinity, total and dissolved metals, ferrous iron, major anions, dissolved gasses, and microbial population. | *Spatial boundaries:* The vertical boundary of the study is the upper RGA as feasible (to the base of HU4 interval) at all sites. The results of soil TCE analyses will be provided to EPA and KDEP on a timely basis, and the FFA Parties will confer via teleconference regarding the need for further sampling in the RGA. TCE concentrations above cleanup levels are present at the maximum depths sampled in previous investigations.<br>Surface and subsurface infrastructure is present in the C-720 source areas. The C-720 building bounds the north side of the southeast source area.<br>*Schedule boundaries:* The focused investigation results must be available by the start of development of the 90% remedial design. Fieldwork and lab analysis turnaround is anticipated to require approximately 120 days.<br>*Operational boundaries:* Field investigations and remedial design are constrained by surface and subsurface infrastructure at the C-720 Building. No significant interferences exist at the Oil Landfarm. None of the areas are posted as radiological contamination areas; however, VOCs, metals, and SVOCs are present in soils. An underground storage tank near northeast corner of C-720 may present problems both as subsurface infrastructure and source of petroleum in soils.<br>*Administrative boundaries:* The investigation includes subcontracting for a field laboratory to provide near real time analysis of VOCs in soil and groundwater. Establishment of a field laboratory facility will require development of additional work control. | DR-1: If soil boring-averaged concentrations of TCE and TCE degradation products in soil of the UCRS exceed cleanup levels for a given soil boring, then include the location in the treatment area. If the soil boring-averaged soil concentrations do not exceed cleanup levels, then the area need not be included in the treatment area. | Definitive data quality is assumed for fixed-base and field laboratory analysis.<br>Screening level data quality is assumed for field analyses.<br>The soil boring-averaged contaminant concentration will be derived solely from laboratory analyses from each 5-ft depth interval. The derived soil boring-averaged contaminant concentration will be used as a definitive criterion for comparison with the remediation goal, with no consideration for false rejection rate or false acceptance rate. The sampling plan minimizes decision error by intentionally biasing the location of the sample for laboratory analysis to the location of highest field PID measurement in each 5-ft depth interval. | The selected treatment technologies are able to address the range of small discrete areas to broad areas. There effectively is no minimum or maximum decision area.<br>A combination of field screening instruments, field laboratory analysis, and fixed-base laboratory confirmation analysis will be used to define the outer extent of the area contaminated above the remediation goals.<br>The contaminants of interest are TCE and degradation products: 1,1 dichloroethene; *cis*-1,2-dichloroethene; *trans*-1,2-dichloroethene; and vinyl chloride.<br>The targeted depth of investigation is 60 ft bgs, which penetrates through the average depth of the base of the HU4 at SWMU 1 and at the C-720 sites.<br>Where one or more soil boring-averaged contaminant concentrations in a soil boring exceed an RG for a site, contingency borings will be sampled, as necessary (up to the contingency allotment for each site), to bound the remediation area. At SWMU 1, successive contingency boring step outs nominally will be 75 ft. (Multiple contingency borings may extend the investigation beyond 75 ft of the SWMU boundary.) At the C-720 sites, contingency boring step outs must be consistent with the sampling grid except where prevented by the presence of utilities or other obstructions.<br>Parameters as established in quality assurance project plan for precision, accuracy, representativeness, completeness, and comparability.<br>A combination of field measurements and fixed-base laboratory analysis will be used to quantify key design criteria for the preferred alternatives. |

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text in Table 1 contains references to SWMU 1, which are artifacts of the scoping process and not intended to provide information for SWMU 1 as part of this final characterization report. The resulting sampling and analysis plan is described in Section 4. The Quality Assurance Project Plan (QAPP) for the RDSI [Attachment A5 of the RDWP (DOE 2012a)] contains measurement quality objectives and data quality indices derived from the project DQOs that ensured quality data was obtained to adequately assess SWMUs 211-A and 211-B. With the few exceptions noted in Section 4.9, all VOC analyses associated with soil and groundwater samples of the RDSI meet measurement performance and other assessment criteria of the project QAPP and are included in this FCR. In addition to the RDSI data, this FCR incorporates data from the WAG 27 RI and Southwest Plume SI, as required by the project DQOs and QAPP (DOE 2012a).

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# 4. FINAL CHARACTERIZATION/RDSI PLANNING

RDSI planning includes evaluating existing data, DQO scoping, and performing a site visit. Additionally, planning is necessary to protect health and safety, develop the environmental sampling protocol, and identify procedures for handling investigation derived waste. Each activity has been completed and is discussed below.

## 4.1 EVALUATION OF EXISTING DATA

The preliminary C-720 northeast and southeast site boundaries shown in the Southwest Plume FFS were based on the fate and transport model grid for the C-720 area used in the WAG 27 RI (DOE 1999) and the Southwest Plume SI (DOE 2007). The Groundwater OU Feasibility Study (DOE 2001) also provided estimates of source area locations and dimensions. These estimates were used in the Southwest Plume FFS to define the SWMU 211-A and 211-B boundaries shown on Figures 4 and 5, respectively.

## 4.2 INITIAL SAMPLING LOCATIONS

By combining data from previous reports as well as information obtained through Oak Ridge Environmental Information System (OREIS), a new general sample boundary area was drawn for the C-720 northeast (i.e., SWMU 211-A) and southeast (i.e., SWMU 211-B) sites (Figures 4 and 5, respectively). The boundaries incorporate historical detections of TCE contamination and extend a short distance outward from these locations. Two sampling locations (720-018 and P4-H7/720-027) in the C-720 northeast site identified during the SI as having at least one TCE detection at a concentration greater than 70 µg/kg are included within the sampling area. Sampling grid spacing and sampling location coordinates presented in Appendix A.1 of the RDWP (DOE 2012a) were used as a guide, but site obstructions and/or sample results were used to determine appropriateness of sample locations.

## 4.3 DQO SCOPING MEETING

A DQO scoping meeting, attended by subject matter experts, was held February 4, 2010, to gather input to DQO development for the RDSI characterization plan. Subsequently, additional meetings were held, from which data needs specific to the selected remedies were identified. The results from those meetings are presented in the DQOs provided in Section 3.

## 4.4 SITE WALKDOWNS

The SWMU 211-A and 211-B source areas were visited by the project team prior to commencement of the RDSI characterization plan implementation. The site visits to SWMU 211-A and 211-B were conducted in June and July of 2012. A LATA Kentucky surveyor completed the site walkdown to locate and mark utilities with the aid of plant drawings and coordinates, a handheld Metrotech line locator, and a Geophysical Survey Systems, Inc., ground penetrating radar system, model SIR-3000.

Following the site walkdowns the proposed sample locations at SWMU 211-A required no modifications. The SWMU 211-B proposed locations were shifted toward building C-720 by approximately 5 ft to avoid contact with the sewer drain system.

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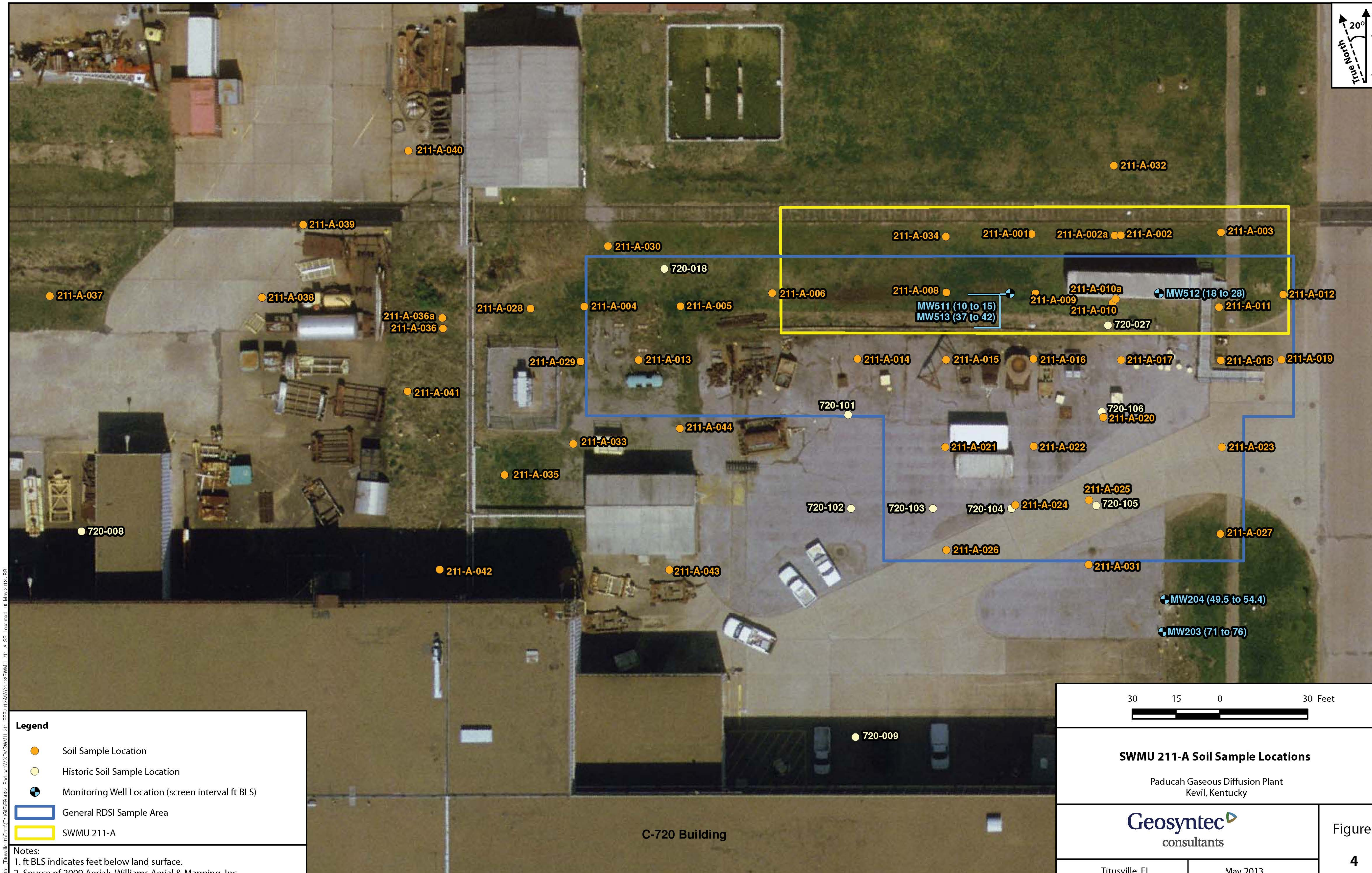


Figure 4. SWMU 211-A Soil Sample Locations

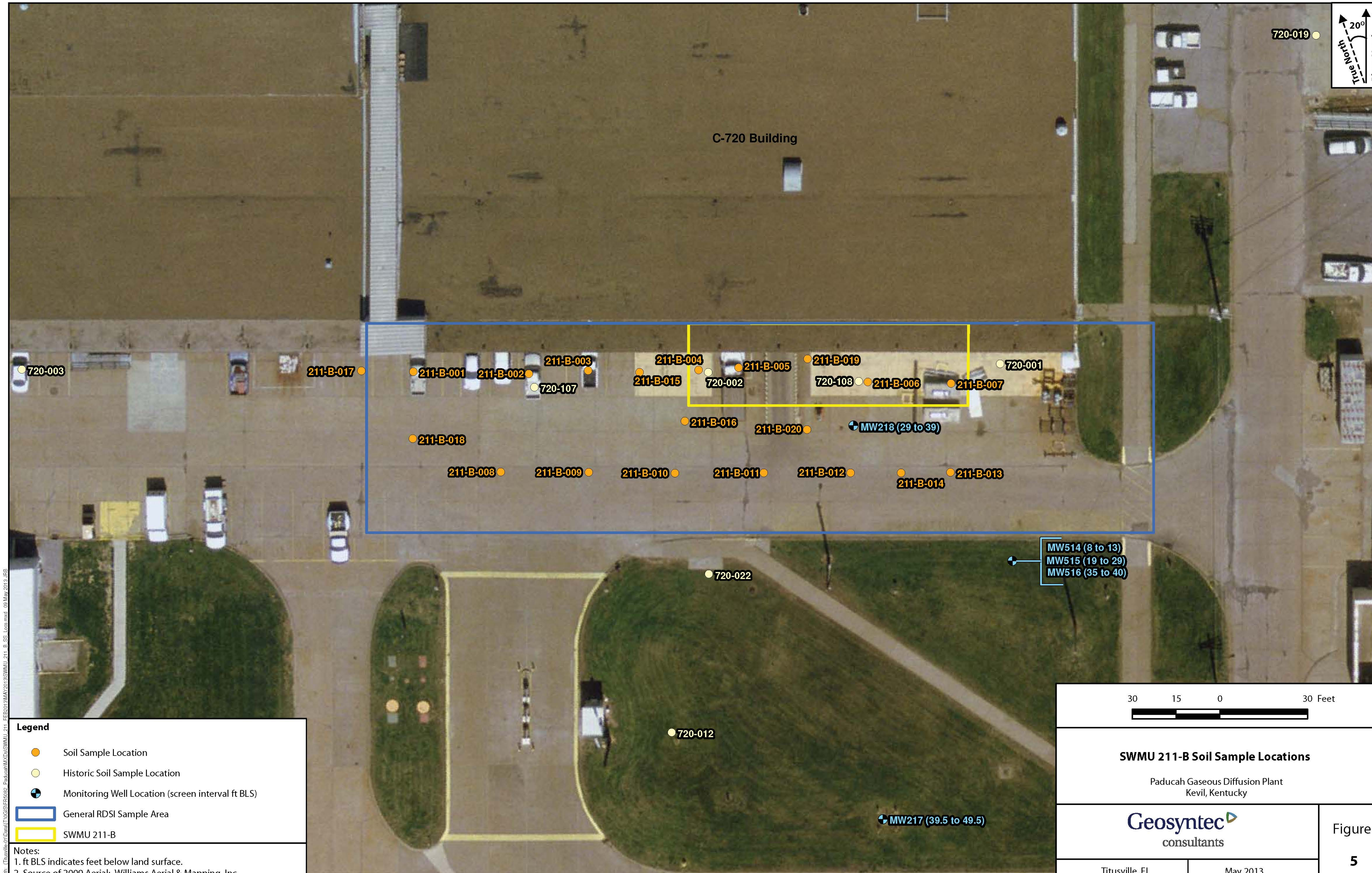


Figure 5. SWMU 211-B Soil Sample Locations

## 4.5 HEALTH AND SAFETY

Environmental sampling to protect the health and safety of the workers is an important part of any related project. During drilling and sampling operations, a photoionization detector (PID) was used to determine if VOCs were present at hazardous levels in the workers' breathing zone. Personal samplers were also used to establish baseline values early in the project. Monitoring for radioactive contamination was conducted according to the radiation work permit. Additional details and requirements for health and safety sampling are contained in the *Health and Safety Plan for the Southwest Plume Remedial Design Support Investigation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PAD-PROJ-0133/R0 (LATA Kentucky 2012).

## 4.6 SOIL SAMPLING STRATEGY

The SWMU 211-A and 211-B boundaries shown in the Southwest Plume FFS were based on the fate and transport model grid for the C-720 area used in the WAG 27 RI (DOE 1999) and the Southwest Plume SI (DOE 2007). The Groundwater OU Feasibility Study (DOE 2001) also provided estimates of source area locations and dimensions. These estimates were used in the Southwest Plume FFS to define the SWMU boundaries. The data from these three reports and information obtained through OREIS were combined and a sample boundary area was presented in the RDSI as shown in Figures 4 and 5. The boundaries encompassed historical detections of TCE and extended a short distance outward from the detections and provided a general starting point for this RDSI. Figures 4 and 5 show the actual sampling locations for SWMUs 211-A and 211-B, respectively. Table 2 provides PGDP coordinates for the sampling locations depicted in Figure 4 for SWMU 211-A. Table 3 provides PGDP coordinates for the sampling locations depicted in Figure 5 for SWMU 211-B.

Soil borings 211-A-001 through 211-A-036 and 211-B-001 through 211-B-020 were performed from August 16 through October 19, 2012. Follow-on sampling at SWMU 211-A (soil borings 211-A-037 through 211-A-044) was performed from February 25 through March 6, 2013. Soil borings were completed using an AMS 9500 VTR rig with Geoprobe direct push technology (DPT) DT-22 tooling and polyvinyl chloride sample liners, provided by Chase Environmental Group, Inc. (Kevil, Kentucky).

## 4.7 MONITORING WELL INSTALLATION

MWs were installed at SWMU 211-A (MW511, MW512, and MW513) and SWMU 211-B (MW514, MW515, and MW516) in August 2012 using hollow stem auger drilling methods. Tables 4 and 5 provide well construction details for the MWs installed at SWMU 211-A and SWMU 211-B, respectively. The locations of the newly installed MWs are presented on Figure 4 (SWMU 211-A) and Figure 5 (SWMU 211-B).

At SWMU 211-A, MW511 and MW513 were installed as a cluster within a common borehole using a 6.25-inch inside diameter (ID) auger, and MW512 was installed using a 4.25-inch ID auger. The MWs were constructed of 2-inch diameter stainless screen and riser, with screen intervals of 10 to 15 ft bgs, 359.03 to 364.03 ft amsl (MW511), 18 to 28 ft bgs, 346.68 to 356.68 ft amsl (MW512), and 37 to 42 ft bgs, 332.02 to 337.02 ft amsl (MW513). MW construction logs are included in Appendix A.

At SWMU 211-B, MW514, MW515, and MW516 were installed as a cluster within a common borehole using a 8.25-inch ID auger. The MWs were constructed of 2-inch diameter stainless screen and riser, with screen intervals of 8 to 13 ft bgs, 359.73 to 364.73 ft amsl (MW514), 19 to 29 ft bgs, 343.75 to

353.75 ft amsl (MW515), and 35 to 40 ft bgs, 332.77 to 337.77 ft amsl (MW516). MW construction logs are included in Appendix A.

**Table 2. PGDP Plant Coordinates for SWMU 211-A Source Area Sampling Locations**

| Station | Plant Coordinates | | Elevation [ft amsl] |
|---|---|---|---|
| | Northing [ft] | Easting [ft] | |
| 211-A-001 | -2023.2110 | -5059.5510 | 374.598 |
| 211-A-002 | -2023.6120 | -5029.1430 | 374.504 |
| 211-A-002a | -2023.7790 | -5031.2360 | 374.476 |
| 211-A-003 | -2022.6390 | -4994.8430 | 374.913 |
| 211-A-004 | -2048.0820 | -5212.8110 | 373.283 |
| 211-A-005 | -2047.9830 | -5179.8330 | 373.701 |
| 211-A-006 | -2043.4640 | -5148.4270 | 374.090 |
| 211-A-008 | -2043.2190 | -5088.8040 | 374.092 |
| 211-A-009 | -2043.5870 | -5058.3150 | 374.263 |
| 211-A-010 | -2046.7240 | -5031.9270 | 374.330 |
| 211-A-010a | -2045.4290 | -5030.7210 | 374.359 |
| 211-A-011 | -2048.2000 | -4995.4900 | 375.221 |
| 211-A-012 | -2043.9840 | -4973.5470 | 375.458 |
| 211-A-013 | -2066.2640 | -5194.1350 | 374.351 |
| 211-A-014 | -2065.9010 | -5119.3050 | 374.469 |
| 211-A-015 | -2066.2010 | -5088.9670 | 374.601 |
| 211-A-016 | -2065.9450 | -5059.0230 | 374.653 |
| 211-A-017 | -2066.3420 | -5029.0030 | 374.894 |
| 211-A-018 | -2066.3810 | -4994.8990 | 374.865 |
| 211-A-019 | -2066.1750 | -4974.1430 | 374.771 |
| 211-A-020 | -2085.9880 | -5035.1640 | 374.833 |
| 211-A-021 | -2096.0950 | -5089.2170 | 374.593 |
| 211-A-022 | -2095.8230 | -5058.8970 | 374.620 |
| 211-A-023 | -2096.1320 | -4994.5060 | 374.620 |
| 211-A-024 | -2115.8920 | -5065.2080 | 374.350 |
| 211-A-025 | -2114.2460 | -5040.0200 | 374.210 |
| 211-A-026 | -2131.2640 | -5088.8230 | 374.296 |
| 211-A-027 | -2125.7710 | -4995.0460 | 374.622 |
| 211-A-028 | -2048.7590 | -5231.1660 | 373.633 |
| 211-A-029 | -2066.7480 | -5214.0940 | 374.274 |
| 211-A-030 | -2027.3620 | -5204.6280 | 373.823 |
| 211-A-031 | -2136.2860 | -5040.0740 | 373.999 |
| 211-A-032 | -1999.9050 | -5031.5160 | 373.362 |
| 211-A-033 | -2094.9760 | -5216.5300 | 374.359 |

**Table 2. PGDP Plant Coordinates for SWMU 211-A Source Area Sampling Locations (Continued)**

| Station | Plant Coordinates | | Elevation [ft amsl] |
|---|---|---|---|
| | Northing [ft] | Easting [ft] | |
| 211-A-034 | -2024.1310 | -5089.0630 | 374.423 |
| 211-A-035 | -2105.5170 | -5240.0280 | 373.994 |
| 211-A-036 | -2055.4830 | -5261.2480 | 374.472 |
| 211-A-036a | -2051.9460 | -5261.3630 | 374.415 |
| 211-A-037 | -2044.5470 | -5395.8070 | 373.516 |
| 211-A-038 | -2045.0350 | -5323.1710 | 374.499 |
| 211-A-039 | -2020.1390 | -5309.1090 | 374.571 |
| 211-A-040 | -1994.8890 | -5272.9960 | 374.583 |
| 211-A-041 | -2077.0010 | -5273.3620 | 373.935 |
| 211-A-042 | -2137.9710 | -5262.2770 | 373.996 |
| 211-A-043 | -2138.0230 | -5183.7380 | 374.863 |
| 211-A-044 | -2089.7250 | -5180.1200 | 374.396 |

**Table 3. PGDP Plant Coordinates for SWMU 211-B Source Area Sampling Locations**

| Station | Plant Coordinates | | Elevation [ft amsl] |
|---|---|---|---|
| | Northing [ft] | Easting [ft] | |
| 211-B-001 | -2607.6980 | -5240.8990 | 371.916 |
| 211-B-002 | -2608.4570 | -5201.4670 | 371.965 |
| 211-B-003 | -2607.3650 | -5181.1500 | 372.000 |
| 211-B-004 | -2607.1870 | -5143.3300 | 371.941 |
| 211-B-005 | -2606.3070 | -5129.5960 | 371.940 |
| 211-B-006 | -2611.2800 | -5085.4310 | 371.960 |
| 211-B-007 | -2611.7170 | -5056.8590 | 372.028 |
| 211-B-008 | -2642.0290 | -5211.0330 | 371.474 |
| 211-B-009 | -2642.0580 | -5180.9140 | 371.359 |
| 211-B-010 | -2642.3830 | -5151.4210 | 371.331 |
| 211-B-011 | -2642.3070 | -5120.9840 | 371.318 |
| 211-B-012 | -2642.2870 | -5091.2570 | 371.587 |
| 211-B-013 | -2642.1370 | -5057.0470 | 371.850 |
| 211-B-014 | -2642.3210 | -5074.0080 | 371.668 |
| 211-B-015 | -2607.9310 | -5163.5150 | 371.996 |
| 211-B-016 | -2624.6240 | -5148.0390 | 371.569 |
| 211-B-017 | -2607.4590 | -5258.7540 | 371.976 |
| 211-B-018 | -2630.5500 | -5241.1330 | 371.646 |
| 211-B-019 | -2603.3600 | -5105.9730 | 371.996 |
| 211-B-020 | -2627.5870 | -5106.1450 | 371.664 |

## Table 4. PGDP SWMU 211-A Well Construction Details

| Well Number | Date Installed | Riser Casing Materia l | Riser Casing Diameter [in] | Screened Zone | HU | Top of Screen [ft bgs] | Bottom of Screen [ft bgs] | Screen Materia l | Screen Diameter [in] | Datum Elevation [ft NAVD88] | Datum Reference | Plant Coordinates | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Northing [ft] | Easting [ft] |
| Preexisting Wells | | | | | | | | | | | | | |
| MW203 | 4/3/1991 | SLS | 2 | RGA | HU5 | 71 | 76 | SLS | 2 | 377.91 | TOC | -2,159.20 | -5014.80 |
| MW204 | 4/5/1991 | SLS | 2 | UCRS | HU3 | 49.5 | 54.4 | SLS | 2 | 378.06 | TOC | -2148.10 | -5014.10 |
| RDSI-installed Wells | | | | | | | | | | | | | |
| MW511 | 8/27/2012 | SLS | 2 | UCRS | HU1 | 10 | 15 | SLS | 2 | 376.82 | TOC | -2042.42 | -5176.15 |
| MW512 | 8/24/2012 | SLS | 2 | UCRS | HU2 | 17.8 | 27.8 | SLS | 2 | 377.59 | TOC | -2044.32 | -5043.47 |
| MW513 | 8/27/2012 | SLS | 2 | UCRS | HU3 | 37 | 42 | SLS | 2 | 376.82 | TOC | -2042.42 | -5176.15 |

Notes:
1. SLS—stainless steel
2. PVC—polyvinyl chloride
3. NAVD88—North American Vertical Datum of 1988
4. TOC—top of casing
5. TIC—top of internal casing



## Table 5. PGDP SWMU 211-B Well Construction Details

| Well Number | Date Installed | Riser Casing Material | Riser Casing Diameter [in] | Screened Zone | HU | Top of Screen [ft bgs] | Bottom of Screen [ft bgs] | Screen Material | Screen Diameter [in] | Datum Elevation [ft NAVD88] | Datum Reference | Plant Coordinates | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Northing [ft] | Easting [ft] |
| Preexisting Wells | | | | | | | | | | | | | |
| MW217 | 12/18/91 | PVC | 2 | UCRS | HU3 | 39.5 | 49.5 | PVC | 2 | 378.56 | TIC | -2760.66 | -5080.28 |
| MW218 | 1/30/1992 | PVC | 2 | UCRS | HU2/3 | 29.0 | 39.0 | PVC | 2 | 371.63 | TIC | -2626.16 | -5090.38 |
| RDSI-installed Wells | | | | | | | | | | | | | |
| MW514 | 8/27/2012 | SLS | 2 | UCRS | HU1 | 7.8 | 12.8 | SLS | 2 | 375.67 | TOC | -2673.93 | -5036.81 |
| MW515 | 8/27/2012 | SLS | 2 | UCRS | HU2 | 18.8 | 28.8 | SLS | 2 | 375.67 | TOC | -2673.93 | -5036.81 |
| MW516 | 8/27/2012 | SLS | 2 | UCRS | HU3 | 34.8 | 39.8 | SLS | 2 | 375.67 | TOC | -2673.93 | -5036.81 |

Notes:
1. SLS—stainless steel
2. NAVD88—North American Vertical Datum of 1988
3. TOC—top of casing

## 4.8 INVESTIGATION-DERIVED WASTE

Investigation-derived waste generated during the performance of fieldwork associated with this FCR is considered part of the Southwest Plume RDSI. As such, only a portion of the following inventory of the Southwest Plume RDSI-generated waste is directly associated with SWMUs 211-A and 211-B.

- Nine ST-90 boxes and two 55-gal drums of soil/personal protective equipment and debris (approximately 825 $ft^3$).
  - All but one of the ST-90 boxes and the two 55-gal drums have been disposed of at the C-746-U Contained Landfill [permitted for operation by the Kentucky Division of Waste Management (Solid Waste Landfill Permit Number 073-00045)].
  - Sample results for the remaining ST-90 box have been received from the laboratory. The results are being processed in documentation for disposal at the C-746-U Contained Landfill.
- One 55-gal drum of personal protective equipment from decontamination activities (approximately 7.4 $ft^3$).
  - The 55-gal drum has been disposed of at the C-746-U Landfill.
- Five 1,200-gal poly tanks of decontamination water (approximately 802 $ft^3$).
  - The decontamination water has been treated for suspended solids and staged in two tanks.
  - Of the two tanks, one has been characterized and approved for discharge at C-612. Characterization data for the second tank have been received and are being processed for approval for discharge through C-612.

## 4.9 DATA EVALUATION

Data verification, validation, and assessment were performed for the project data in accordance with PAD-ENM-5003, *Quality Assured Data* (LATA Kentucky 2010). The data evaluation results are stored in Paducah Project Environmental Measurements System and are transferred with the data to Paducah OREIS.

The data evaluation for the RDSI identified the following variances. At SWMU 211-A, a total of 31 planned borings and 10 contingency borings were allotted. The investigation sampled 30 of the planned borings and 12 contingency borings. DOE sampled the 2 additional contingency borings to better characterize the extent of the VOC contamination. (For SWMU 211-B, a total of 17 planned borings and 12 contingency borings were available. Only the original 17 planned borings and 2 contingency borings were required to characterize the extent of contamination.)

The investigation soil analyses include a single exceedance of the laboratory reporting limits required by the RDWP (DOE 2012a). The analysis for 1,1-DCE in the sample from 211-A-036 at 22 ft depth (352.47 ft amsl) reports a result of 31 "U" µg/kg; the reporting limit for 1,1-DCE is required to be 10 µg/kg. This variance is anticipated to have minimal impact to the project. Analyses of 1,1-DCE for deeper samples in this soil boring significantly exceed the 1,1-DCE remediation goal (137 µg/kg) while analyses for shallower samples report nondetect levels.

Groundwater analyses include exceedances of the required laboratory reporting limit only for *trans*-1,2-DCE and vinyl chloride in 1 of 3 samples from MW204 and the lone sample from MW513 (both SWMU 211-A MWs). In MW204, the highest reporting limits (2 µg/L *trans*-1,2-DCE and 4 µg/L VC) are twice the required reporting limits. Because all three results for these analytes in MW204 are "U" qualified, this variance has little impact to the groundwater assessment.

In the lone MW513 groundwater sample, the reporting limits (10 µg/L *trans*-1,2-DCE and 20 µg/L VC) are 10 times the required reporting limits (due to a 10 × dilution of the sample); however, analyses for collocated wells MW511 and MW512 (nondetect levels of 1 µg/L *trans*-1,2-DCE and 2 µg/L VC in both wells) provide good characterization of UCRS groundwater quality at SWMU 211-A. The RDWP (DOE 2012a) identified method ASTM D4360-96 or equivalent for constant head injection tests of the RDSI. The correct method reference is ASTM D4630-96.

Level IV data validation for SWMUs 211-A and 211-B was performed at a rate of 10%, as required by the RDSI characterization plan. Samples from areas with higher TCE concentrations were targeted for data validation. No data was rejected during data validation. During validation, the soils and groundwater data were found to meet the project acceptance criteria except as noted below.

- **SWMU 211-A soil samples (VOCs)**

  — Analyses from the validated samples showed compliance with the quality control requirements set forth by the analytical methods. The data was considered valid and acceptable. Chains of custody were reviewed and found to be compliant. All samples were analyzed within the acceptable holding times. The instrument performance check was performed within the required time period and met all acceptance criteria. All initial calibrations were performed at the proper frequency. All continuing calibrations were performed at the proper frequency. Method blanks were analyzed at the proper frequency. Results for VOC analyses for 12 samples were qualified "J" (indicating estimated values) due to surrogate recovery results as follows:

  – 211-A-028 at 48.0 ft depth/325.63 ft amsl
  – 211-A-028 at 50.5 ft depth/323.13 ft amsl
  – 211-A-029 at 28.5 ft depth/345.77 ft amsl
  – 211-A-029 at 32.0 ft depth/342.27 ft amsl
  – 211-A-029 at 48.5 ft depth/325.77 ft amsl
  – 211-A-030 at 32.5 ft depth/341.32 ft amsl
  – 211-A-036 at 22.0 ft depth/352.47 ft amsl
  – 211-A-036 at 26.5 ft depth/347.97 ft amsl
  – 211-A-036 at 31.5 ft depth/342.97 ft amsl
  – 211-A-036 at 35.5 ft depth/338.97 ft amsl
  – 211-A-036 at 44.5 ft depth/329.97 ft amsl
  – 211-A-036 at 47.5 ft depth/326.97 ft amsl

  All internal standards were analyzed at the appropriate frequency and met acceptance criteria. Results for VOC analyses for five samples were qualified "J" due to MS/MSD (matrix spike/matrix spike duplicate) recoveries as follows:

  – 211-A-004 at 24.9 ft depth/348.38 ft amsl
  – 211-A-028 at 38.5 ft depth/335.13 ft amsl
  – 211-A-028 at 55.1 ft depth/318.53 ft amsl
  – 211-A-029 at 28.5 ft depth/345.77 ft amsl
  – 211-A-036 at 44.5 ft depth/329.97 ft amsl

The calculated RPD (relative percent difference) was exceeded for the parent sample and its duplicate for 1,1-DCE and TCE. The results for these two analytes were “J” qualified in the parent and duplicate samples.

– 211-A-029 at 32 ft depth/342.27 ft amsl

LCS (laboratory control sample) and LCSD (laboratory control sample duplicate) samples were analyzed at the proper frequency. Review of calculations met acceptance criteria.

- **SWMU 211-B soil samples (VOCs)**

— Analyses from the validated samples showed compliance with the quality control requirements set forth by the analytical methods. The data was considered valid and acceptable. Chains of custody were reviewed and found to be compliant. All samples were analyzed within the acceptable holding times. The instrument performance check was performed within the required time period and met all acceptance criteria. All initial calibrations were performed at the proper frequency. All continuing calibrations were performed at the proper frequency. Method blanks were analyzed at the proper frequency. The proper surrogate standards were analyzed at the appropriate frequency. No data was qualified due to surrogate recovery limits. All internal standards were analyzed at the appropriate frequency and met acceptance criteria. Results for VOC analyses for two samples were qualified “J” due to MS/MSD recoveries:

– 211-B-005 at 4.9 ft depth/367.04 ft amsl
– 211-B-19 at 32.0 ft depth/340.00 ft amsl

The calculated RPD was exceeded for the parent sample and duplicate samples for TCE. TCE results were “J” qualified in the parent and duplicate samples:

– 211-B-005 at 29.5 ft depth/342.44 ft amsl

LCS and LCSD samples were analyzed at the proper frequency. Review of calculations met acceptance criteria.

- **SWMU 211-A and 211-B water samples (VOCs, metals, chloride, nitrate, sulfate)**

— Analyses from the validated samples showed compliance with the quality control requirements set forth by the analytical methods. The data was considered valid and acceptable. Chains of custody were reviewed and found to be compliant. All samples were analyzed within the acceptable holding times.

– **VOCs**—VOCs results for two samples were qualified as either “J” or “UJ” (indicating not detected at or below the lowest concentration reported but estimated) due to the presence of headspace in the samples (MW162 and MW218). The instrument performance check was performed within the required time period and met all acceptance criteria. All initial calibrations were performed at the proper frequency. All continuing calibrations were performed at the proper frequency. No qualification of the data was required based on the evaluation of the continuing calibration. Method blanks were analyzed at the proper frequency. Results for two samples were qualified due to surrogate recoveries (MW161 and MW203). All internal standards were analyzed at the appropriate frequency and met acceptance criteria. Some results were qualified “J” or “UJ” based on low recovery observed in both the MS/MSD and the LCS. The RPD for the duplicate sample analyses were within acceptance criteria. Some results were “J” or “UJ” qualified due to LCS and LCSD acceptance criteria (MW161, MW162, MW203, MW204, MW217, and MW218). Review of calculations met acceptance criteria.

– **Metals**—All initial and continuing calibrations were within the acceptance criteria. All method and continuing calibration blanks were analyzed at the proper frequency. There was no qualification of data based on recoveries of the method blanks. The MS/MSD samples were analyzed at the proper frequency. Manganese in one sample was qualified “J” based on the recovery in the MS/MSD (MW516). The percent recoveries for the post digestion spike were all within the acceptance criteria. Chromium and iron in a sample and duplicate were qualified “J” based on exceeding the RPD (MW203). Iron and total and dissolved manganese were qualified “J” in a sample and duplicate based on exceeding the RPD (MW509). LCS samples were analyzed at the proper frequency. All LCS recoveries were within acceptance criteria. Dissolved manganese for one sample was “J” qualified based on the serial dilution recovery (MW516). Interference check sample results were all within the acceptance criteria. All internal check standards were within the acceptance criteria. Review of calculations met acceptance criteria.

– **Chloride, Nitrate, and Sulfate**—All calibrations were within the acceptance criteria. All method blanks were run at the proper frequency. All method blanks were confirmed nondetect. LCS samples were analyzed at the proper frequency and were within acceptance criteria. MS/MSD samples were analyzed at the proper frequency and were within acceptable limits. Review of calculations met acceptance criteria.

– **Methane, Ethane, and Ethene**—All initial and continuing calibrations were performed at the proper frequency and within acceptance criteria. A review of raw data, including chromatograms of standards used were found to be acceptable. Method blanks were analyzed at the proper frequency. Raw data were reviewed and confirmed no detections present in the method blank. All percent recoveries for the MS and MSD were within acceptance criteria. The LCS and LCSD samples were analyzed at the proper frequency and were all within the acceptance criteria. Calculations were reviewed and confirmed.

All soil samples were reported on a dry weight basis. All holding times for soil and water samples were met. Field blanks and equipment blanks were collected at a rate of 5%. All results were acceptable. Trip blanks were collected one per cooler. All results were acceptable.

## 4.10 DATA ASSESSMENT AND VERIFICATION

Data assessment and verification were performed on 100% of the data. Data verification includes checking methods, units, reporting limits, holding times, and analytical completeness. Exceptions to the data verification were noted in the data assessment package and were considered during data assessment.

Data assessment considered results of the Level IV data validation, data verification, laboratory data qualifiers, laboratory comments, and sampler’s comments. All data were found to be of known quality, and it was determined that decisions could be made from the data based on the review.

The RDSI field investigation achieved a high degree of completeness as summarized below. For the SWMU 211-A soils VOC characterization, sampling and analysis accomplished the following:

- **Number of soil borings**

  — Twenty-six of 27 initially located soil borings were sampled.[3]

  — Four of four additional borings were sampled in the vicinity of the planned soil boring with highest average VOC levels (211-A-038 through 211-A-041).

  — Twelve contingency borings were sampled (211-A-029 through 211-A-037 and 211-A-042 through 211-A-044), of 10 originally planned contingency borings.

- **Number of VOC analyses**

  — Five hundred forty-one of a potential 548 sample depths (98.7%) were characterized in the soil borings.

  — Five thousand eight hundred eighty-two of a potential of 5,954 field PID readings (98.8%) were measured in the soil borings.

For SWMU 211-B soils VOC characterization, sampling analysis accomplished the following:

- **Number of soil borings**

  — Thirteen of 13 initially located soil borings were sampled.

  — Four of four borings were sampled in the vicinity of the planned soil boring with highest average VOC levels (211-B-015, 211-B-016, 211-B-019, and 211-B-020).

  — Two of the allotted six contingency borings were sampled (211-B-017 and 211-B-018).

- **Number of VOC analyses**

  — Two hundred forty-six of a potential of 249 sample depths (98.8%) were characterized in the soil borings.

  — Two thousand six hundred fifty-one of a potential of 2,693 field PID readings (98.4%) were measured in the soil borings.

## 4.11 UNCERTAINTY EVALUATION

Factors that may affect uncertainty in site characterization data sets may include the following:

- Results and frequencies of quality control samples, quality control exceedances, and qualifiers;
- Biases and trends in the data; and
- Project completeness.

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[3] The FFA parties concurred to not sample soil boring 211-A-007.

As documented in Section 4.9, quality control exceedances and the occurrence of data qualifiers are sparse. Consequently, these factors are not envisioned to affect substantially the utility of the data in regard to estimation of the extent and mass/volume of VOCs in the UCRS and upper RGA at SWMUs 211-A and 211-B and associated decisions with regard to selection of a final remedy for these sites.

Sampling and analysis protocols identified in the RDSI characterization plan were selected to minimize the loss of VOCs, thereby reducing the potential or uncertainty associated with underestimating the presence of VOCs. The field investigation followed the characterization plan for sample technique and laboratory methods. A fixed-based laboratory, offering same day courier service with overnight analyses, was used for the VOC analyses and provided a degree of quality control that was superior to that which would have been provided if VOC analyses were conducted using the field laboratory option contained in the characterization plan.

The objective of the RDSI was to characterize the extent and mass/volume of VOC soil contamination in the UCRS and upper RGA at SWMUs 211-A and 211-B. The RDSI characterization plan (provided in DOE 2012a) was designed specifically to reduce the potential for decision error through an underestimation of mass through the identification and selection of the highest VOC concentration samples. Each 60-ft deep borehole core was divided into 5 ft segments over which field screening using a PID was conducted to identify intervals for sample collection and shipment for off-site VOC analysis. This approach was intended to ensure that the resulting VOC mass/volume calculations did not underrepresent the VOC mass/volume present in the subsurface. This approach essentially imposed a bias on the resulting VOC mass/volume calculations for each interval and correspondingly served to reduce the potential for underestimating VOC mass/volume.

Field PID measurements were a primary basis for selection of the sample interval within each 5-ft core from the soil borings. [4] These PID responses were reviewed to assess the potential for trends and biases to be present in the data set. The distribution of maximum PID readings in each 5-ft core is as follows:

| | **SWMU 211-A** | | **SWMU 211-B** | |
|---|---|---|---|---|
| # Cores | 408 | | 228 | |
| # Measurements | 4,488 | | 2,508 | |
| PID Measurement Location in Core | Number of Detections of Maximum | % of Detections of Maximum | Number of Detections of Maximum | % of Detections of Maximum |
| 0.1 ft | 27 | 14.8 | 26 | 14.4 |
| 0.5 ft | 28 | 15.4 | 23 | 12.8 |
| 1.0 ft | 16 | 8.8 | 18 | 10.0 |
| 1.5 ft | 18 | 9.9 | 10 | 5.6 |
| 2.0 ft | 8 | 4.4 | 12 | 6.7 |
| 2.5 ft | 11 | 6.0 | 9 | 5.0 |
| 3.0 ft | 12 | 6.6 | 17 | 9.4 |
| 3.5 ft | 12 | 6.6 | 22 | 12.2 |
| 4.0 ft | 14 | 7.7 | 15 | 8.3 |
| 4.5 ft | 19 | 10.4 | 19 | 10.6 |
| 4.9 ft | 17 | 9.3 | 9 | 5.0 |

[4] In many soil cores with low contamination by VOCs, the PID readings were constant across the core. In those cases, the texture of the soil core was used to define the sample location. Sandy intervals were sampled preferentially.

The percentage of detection of the maximum PID response was notably higher in the upper 0.5 ft of the cores. Follow-up with the manufacturer of the PID used in the field investigation identified moisture interference on the PID lamp as a possible cause for bias. Accordingly, the distribution may indicate a potential bias in PID responses associated with moisture interference.

The effect of moisture-impacted PID response is a potential underestimation of the VOCs mass/volume for those intervals where the maximum PID measurement was in the upper 0.5 ft of the soil core. At SWMU 211-A, 86.5% of the sample locations were not impacted by moisture; at SWMU 211-B, 78.5% of the sample locations were not impacted by moisture. In general, the distribution of maximum PID response and experience of the field crew both indicate that the field PID scan correctly identified the sample interval where high VOC intervals were present deeper in the core. Moreover, the areas of soils with high VOC levels, as identified for the RDSI by the PID and verified with laboratory analysis, are consistent with historical soil analyses, as summarized in the conceptual site model of the RDSI characterization plan (in DOE 2012a).

The RDSI method of using the maximum PID response to select the sample interval intentionally biases the results high compared to random sampling or multi incremental sampling. The moisture-impacted PID response would have led to oversampling of the upper 0.5-ft interval only in those cores with little VOC content. Thus, moisture-impacted PID response would not affect significantly the standard deviation of the data set and would have little influence on the estimation of the mass/volume of VOCs at either SWMU.

In regard to determination of the extent of VOC source material, the field investigation design employed a near uniform sampling grid of both SWMUs 211-A and 211-B. Contingency borings were utilized, as provided in the RDSI characterization plan, to further delineate the extent of the area of VOC contamination based on observed results for samples collected and analyzed based on 24-hour turnaround (quick-turn). Quick-turn analytical results and corresponding plans for contingency locations were reviewed with EPA and Kentucky Division of Waste Management project personnel to obtain concurrence on planned locations and attain project objectives (i.e., determination of the extent of source based VOC mass). This approach also reduced the potential for bias related to delays associated with extended turnaround times for receipt of analytical results and less timely interaction among the FFA parties on contingency sample placement.

Observed trends and potential impacts on uncertainty and decision making were observed as follows. Results for TCE in soil at SWMU 211-A define two discrete areas where average borehole soil TCE concentrations exceed the soil cleanup goal of 75 µg/kg. Each area has unique spatial attributes. In the eastern portion of SWMU 211-A, the distribution of borings where the average borehole TCE concentration exceeds 75 µg/kg defines a north/south feature (95-ft long by 15-ft wide), whereas TCE concentrations in the western portion of the investigation area are distributed equidimensionally (70 ft in the north/south direction by 65 ft in the east/west direction). In both areas at SWMU 211-A, the RDSI data adequately define the extent of VOC concentrations in soils in the UCRS and upper RGA that exceed the identified cleanup goal.

The soil VOC data for SWMU 211-B conforms to the anticipated distribution based on the site conceptual model. The distribution of average borehole TCE concentration that exceed the cleanup goal of 75 µg/kg forms a discrete area on the south side of the C-720 Building (50-ft long by 15-ft wide). The presence of the building precluded delineation of the extent of contamination to the north. The delineation of extent is sufficient to support a decision for SWMU 211-B based on the assumption of a release at the surface on the south side of C-720.

Historical VOC results in the database were used to supplement the RDSI results and assist in the estimation of VOC mass/volume for both SWMUs 211-A and 211-B. The distribution of VOC mass/volume based on the RDSI for 211-B generally conformed to the VOC mass/volume distribution, as defined by historical VOC concentrations. The distribution of VOC mass/volume for SWMU 211-A was significantly enhanced by the inclusion of information gathered during the RDSI. The inclusion of historical VOC data reduces the potential for underestimating VOC mass/volume based on the use of RDSI results only.

The RDSI analysis of extent and mass/volume of TCE contamination, developed with input from the FFA parties, was based on kriging all sample points compared to an interpolation of the borehole-average TCE analyses (the statistical metric used to develop the remediation goals for SWMUs 211-A and 211-B). Kriging techniques can be used to describe and model spatial patterns, predict values at unmeasured locations, and assess the uncertainty associated with a predicted value at the unmeasured locations. The technique provides a "standard error" that may be used to quantify confidence levels. The RDSI data were evaluated using 50% and 90% confidence intervals, where the confidence interval indicates the probability that the predicted mass of VOC contamination in the subsurface at the SWMU, given the distribution of samples, either exceeds or is less than the estimate. The resulting mass/volume estimate for TCE, based on the 90% confidence interval, provided a more robust approach than initially envisioned and presented in the RDSI characterization plan (DOE 2012a). The method used reduces the potential for underestimating VOC mass through the use of the 90% confidence interval in combination with interpolation using individual sample results and inclusion of historical data.

The primary conclusions of the soils VOC data are (1) definition of the location and extent of contaminated soils that exceed the remediation goals identified in the ROD (DOE 2012b) for SWMUs 211-A and 211-B (e.g., 0.075 mg/kg TCE) and (2) estimation of the mass and volume of the TCE contamination. The soil VOC data generated, in combination with historical data, are sufficient and appropriate to define an upper bound for the estimate of the VOC mass and volume to support the selection of a final remedial action for VOCs at each SWMU.

## 4.12 THREE-DIMENSIONAL ANALYSIS

Results of the UCD soil samples from the RDSI and historical data from OREIS are inputs to three-dimensional contamination models for SWMU 211-A and SWMU 211-B using the EVS-ES software. The area historical data in OREIS come from the WAG 27 RI (DOE 1999) and the Southwest Plume SI (DOE 2007). These models estimate the extent of TCE soil impacts and the total TCE mass in soil at each SWMU.

EVS is similar to other environmental decision support software (DSS), such as SitePro and Spatial Analysis and Decision Assistance, and was evaluated by EPA and DOE in 1998 alongside five other DSS packages. EVS underwent an environmental technology verification report in March 2000 that concluded that "the main strengths of EVS-PRO are its outstanding 3-D visualization capabilities and its capability to rapidly process, analyze and visualize data" and "the demonstration showed the EVS-PRO software can be used to generate reliable and useful analyses for evaluating environmental contamination problems."

Several interpolation techniques, including inverse distance weighting, nearest neighbor, and kriging, were evaluated, with kriging ultimately being selected as the primary interpolation technique. Kriging is a stochastic technique similar to inverse distance weighted averaging in that it uses a linear combination of weights at known points to estimate the value at the grid nodes. Kriging is named after D. L. Krige, who used kriging's underlying theory to estimate ore content. Kriging uses a variogram (a.k.a.

semivariogram), which is a representation of the spatial and data differences between some or all possible "pairs" of points in the measured data set. The variogram then describes the weighting factors that will be applied for the interpolation.

It is acknowledged that there are significant uncertainties associated with providing a mass estimate of DNAPL using kriging. Using kriging, however, is still a useful and valid approach to estimate the extent of the source area at various isoconcentration levels below the threshold of residual saturation. Kriging also provides insight about the mass distribution at differing isoconcentration levels. Uncertainty has been considered by estimating mass at different levels of statistical confidence. By kriging data at every node of the model, an average value along with a standard deviation is calculated, thus providing a range of estimated TCE concentrations and ultimately mass. A level of significance of 0.1 (i.e., 90% confidence interval) was used in modeling the geometry and mass of TCE above 75 µg/kg in order to address uncertainty in the estimates.

Each SWMU contaminant model was based on a five-layer geologic model. Analytical results were log processed in the model. The Horizontal/Vertical Anisotropy Ratio parameter, which allows the model to take into consideration expected differences in fluid flow through the soil matrix, was set to a value of 1.5. The Octant Search method was used to determine which sample points are selected for inclusion in the kriging matrix. This method sets a maximum number of points for each octant, which helps offset bias effects of sampling distribution irregularities. The model used a soil density of 1.4 gram per cubic centimeter (g/cc) and a chemical density of 1.46 g/cc.

Model results of TCE soil impacts for SWMU 211-A and SWMU 211-B are illustrated later in this report as the 50% and 90% confidence limits of 75 µg/kg soil TCE and the 90% confidence limit of 1,000 µg/kg soil TCE. Soil TCE mass estimates for SWMUs 211-A and 211-B are reported as the 90% maximum confidence level for the source volume statistical evaluation.

Appendix B provides a CD containing viewable three-dimensional model EVS-ES files. Appendix C is the sensitivity analysis of the source volume estimate.

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# 5. SWMU 211-A RDSI SAMPLE RESULTS

## 5.1 LITHOLOGY

Soil lithology logs that provide a detailed description of soil type and HU transitions are included in Appendix D. Within the SWMU 211-A investigation area, lithology logs reveal the presence of fill material (gravelly fine sand) to a typical depth of approximately 2 ft, underlain primarily by silt with very fine sand representing the HU1 to a typical depth of approximately 20 ft bgs. HU2 was identified from approximately 20 ft bgs to approximately 35 ft bgs and consisted primarily of fine sand and silt with some gravel. HU3, primarily consisting of silt with fine sand and clay, was identified from approximately 35 ft bgs to 60 ft bgs.

## 5.2 SOIL SAMPLE RESULTS

Forty-two DPT soil boring locations (25 original, 18 contingency), shown in Figure 4, were performed on and extending north of the parking lot off the northeastern portion of the C 720 Building. Collected soil cores were screened approximately every 0.5 ft using a PID to identify intervals of maximum organic vapor response, if present. Soil samples were collected from the 0.5 ft interval of maximum PID reading for each 5-ft soil core and sent by courier to the fixed-base laboratory for overnight VOC analysis. The laboratory preliminary analytical results were available by 8:30 a.m. on Monday for samples collected on the previous Friday and by 8:30 a.m. Tuesday through Friday for samples collected the previous day. The next day laboratory results were used to assess actively whether additional borings were needed by comparison of the average contaminant concentration[5] for the samples from each boring to the remediation goal. If the average exceeded the remediation goal, then one or more contingency borings were required.

A total of 541 soil samples was collected from 42 soil boring locations. Soil sample VOC results are summarized in Table 6 and presented in Appendix E. Soil sample depths ranged from 0.1 ft bgs (374.55 ft asml) to 66.5 ft bgs (307.49 ft amsl). The maximum measured TCE result was 4,800 µg/kg from location 211-A-036 at a depth of 47.5 ft bgs (326.97 ft amsl). The observed maximum *cis*-1,2-DCE and VC results of 110 µg/kg and 28 µg/kg (both results "J" qualified indicating estimated values), respectively, also were collected at soil boring location 211-A-036, at a depth of 44.5 ft bgs (329.97 ft amsl). The maximum measured 1,1-DCE result was 4,400 µg/kg from location 211-A-004 at a depth of 40.1 ft bgs (333.18 ft amsl). Soil boring locations 211-A-004 and 211-A-036 are located in the western portion of the investigation area. *Trans*-1,2-DCE was not detected in the collected soil samples above laboratory detection limits. At 12 borings (29%), the borehole average concentration exceeded the remediation goal. A total of 97 soil samples (18%) exceeded the remediation goal. In general, the highest concentrations were noted in the 30 to 50 ft bgs depth range.

Figure 6 illustrates all of the soil TCE analyses for the SWMU 211-A investigation area, overlaid on a map. For reference, soil TCE analyses greater than 75 µg/kg (the borehole average project remediation goal) are noted by yellow highlight.

Subsequent to development of the RDWP (DOE 2012a), the approach for determining the distribution of TCE mass within the UCRS that exceeds soil TCE concentrations of 75 µg/kg was refined based on discussion among the FFA parties. The revised approached included the use of historical TCE soil data for the UCRS contained in OREIS, analytical results from the RDSI, and the use of the spatial

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[5] The average contaminant concentration for a borehole was calculated using one half of the laboratory reporting limit for nondetect analyses and using the greater concentration where analyses of duplicate samples were available.

**Table 6. Soils VOC Data (Average Borehole Concentration) for SWMU 211-A**

| Station | Date Collected | TCE [µg/kg] | 1,1-DCE [µg/kg] | *cis*-1,2-DCE [µg/kg] | *trans*-1,2-DCE [µg/kg] | VC [µg/kg] |
|---|---|---|---|---|---|---|
| **Groundwater Protection Remediation Goal** | | **75** | **137** | **619** | **5290** | **570** |
| 211-A-001 | 8/29/2012 | 3.4 | *** | *** | *** | *** |
| 211-A-002 | 8/30/2012 & 8/31/2012 | 161 | 2.5 | 2.0 | *** | *** |
| 211-A-003 | 9/12/2012 | 18* | 4.1 | 0.5 | *** | *** |
| 211-A-004 | 8/31/2012 & 9/4/2012 | **552** | **763** | 9.1 | *** | *** |
| 211-A-005 | 9/4/2012 | **175** | **163** | 5.2 | *** | 5.9 |
| 211-A-006 | 9/26/2012 | 8.3 | 7.4 | 0.6 | *** | *** |
| 211-A-008 | 9/20/2012 | 12* | 6.8 | 0.6 | *** | *** |
| 211-A-009 | 9/20/2012 | 40* | 4.8 | 0.8 | *** | *** |
| 211-A-010 | 8/16/2012, 9/13/2012 & 9/17/2012 | **135** | 3.4 | 2.3 | *** | *** |
| 211-A-011 | 8/17/2012 | 12* | 6.7 | 0.3 | *** | *** |
| 211-A-012 | 9/17/2012 | 4.9 | 11 | 0.6 | *** | *** |
| 211-A-013 | 9/4/2012 & 9/5/2012 | 34* | 45 | 4.4 | *** | 2.4 |
| 211-A-014 | 9/5/2012 | 12 | 24* | 0.8 | *** | *** |
| 211-A-015 | 9/6/2012 | 36* | 19 | 0.8 | *** | *** |
| 211-A-016 | 9/27/2012 | 58* | 14 | 1.7 | *** | *** |
| 211-A-017 | 9/21/2012 | **276** | *** | 5.6 | *** | 4.3 |
| 211-A-018 | 9/11/2012 & 9/12/2012 | 46* | 5.8 | *** | *** | *** |
| 211-A-019 | 9/12/2012 | 1.3 | 10 | 0.5 | *** | *** |
| 211-A-020 | 9/24/2012 | **297** | 6.7 | 3.7 | *** | *** |
| 211-A-021 | 9/6/2012 | 19 | 32 | 1.8 | *** | 0.2 |
| 211-A-022 | 9/27/2012 | 12* | 4.1 | 0.6 | *** | *** |
| 211-A-023 | 9/11/2012 | 19* | 4.4 | 0.5 | *** | *** |
| 211-A-024 | 9/10/2012 | 9* | *** | 0.4 | *** | *** |
| 211-A-025 | 9/10/2012 | **213** | *** | 13 | *** | *** |
| 211-A-026 | 9/7/2012 | 4.8 | 4.8 | 1.2 | *** | 0.3 |
| 211-A-027 | 9/11/2012 & 9/18/2012 | 55* | 1.6 | 0.7 | *** | *** |
| 211-A-028 | 9/24/2012 | **804** | **904** | 12 | *** | *** |
| 211-A-029 | 9/25/2012 | **351** | **348** | 7.0 | *** | *** |
| 211-A-030 | 9/25/2012 | 12* | 14 | 1.5 | *** | *** |
| 211-A-031 | 9/26/2012 | 32* | *** | 1.1 | *** | *** |
| 211-A-032 | 9/28/2012 | 6.6 | *** | 0.6 | *** | *** |

**Table 6. Soils VOC Data (Average Borehole Concentration) for SWMU 211-A (Continued)**

| Station | Date Collected | TCE [µg/kg] | 1,1-DCE [µg/kg] | *cis*-1,2-DCE [µg/kg] | *trans*-1,2-DCE [µg/kg] | VC [µg/kg] |
|---|---|---|---|---|---|---|
| **Groundwater Protection Remediation Goal** | | **75** | **137** | **619** | **5290** | **570** |
| 211-A-033 | 10/1/2012 | **166** | **140** | 7.1 | *** | *** |
| 211-A-035 | 10/2/2012 | **170** | 131* | 4 | *** | *** |
| 211-A-036 | 10/3/2012 | **1,171** | **1,043** | 20 | *** | 9 |
| 211-A-037 | 2/25/2013 | 0.5 | *** | *** | *** | *** |
| 211-A-038 | 2/25/2013 | 14 | 3.3 | 3.9 | *** | 2.9 |
| 211-A-039 | 2/26/2013 | 0.6 | 7.3 | 0.57 | *** | *** |
| 211-A-040 | 2/26/2013 | *** | 2.5 | *** | *** | *** |
| 211-A-041 | 2/27/2013 | 21* | 36* | 4.3 | *** | 1.2 |
| 211-A-042 | 2/27/2013 | 28* | 20 | 4.2 | *** | 0.6 |
| 211-A-043 | 3/4/2013 | 11 | 2.5 | 15 | *** | *** |
| 211-A-044 | 3/6/2013 | 14* | 3.4 | 131* | *** | 14 |

Notes:

1. Groundwater Protection Remediation Goals from *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2012a).
2. *—Indicates average concentrations that are below the Groundwater Protection Remediation Goal, but at least one sample exceeded the remediation goal.
3. ***—Indicates average concentration not calculated as all boring analyses were "U" qualified (compound analyzed for but not detected at or below the lowest concentration reported) for specific VOC.
4. For "U" qualified analyses, a value of one half the concentration reported was used in calculating the average borehole concentration.
5. Yellow shading and bold text indicate an exceedance of Groundwater Protection Remediation Goals.
6. Soil boring 211-A-007 was not collected.
7. Soil boring 211-A-034 was collected and archived. Boring was not logged or screened for VOC impacts.

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**Legend**

- Soil Boring Location with Average Soil Concentration Exceeding One or Both Remediation Goals
- Soil Boring Location with Average Soil Concentration Less than Both Remediation Goals
- Archive Core Soil Boring Location - Not Sampled
- Historic Soil Boring Location with Average Soil Concentration Exceeding TCE Remediation Goal
- Historic Soil Boring Location with Average Soil Concentration Less than TCE Remediation Goal
- Historic Archive Core Soil Boring Location - Not Sampled
- Monitoring Well Location (screen interval ft BLS)
- Area defined by 90% Confidence Level TCE Concentrations greater than 1,000 μg/kg
- Area defined by Nominal (50%) Confidence Level TCE Concentrations greater than 75 μg/kg
- Area defined by 90% Confidence Level TCE Concentrations greater than 75 μg/kg
- General RDSI Sample Area
- SWMU 211-A

| Groundwater Protection Remediation Goals | | |
|---|---|---|
| Parameter | Abbreviation | UCRS Soil Cleanup Level (μg/kg) |
| Trichloroethene | TCE | 75 |
| 1,1-Dichloroethene | 1,1 DCE | 137 |

| Contour (μg/kg) | Total Area (ft$^2$) | Area (ft$^2$) Exclusive |
|---|---|---|
| 90% CL 75 | 34,000 | 24,500 |
| Nominal 75 | 13,200 | 9,500 |
| 90% CL 1000 | 3,700 | 3,700 |

Notes:
1. Results are presented in microgram per kilogram (μg/kg).
2. Sample depth is presented in feet below land surface (ft BLS).
3. Only those individual volatile organic compounds (VOC) with a result exceeding remediation goals are presented.
4. DUP indicates duplicate sample.
5. J indicates an estimated value.
6. U indicates compound analyzed for but not detected at or below the lowest concentration reported.
7. Yellow shaded, bold text indicates an exceedance of the Groundwater Protection Remediation Goal UCRS Soil Cleanup Target Level for VOCs.
8. *** - indicates average concentration not calculated as all boring samples were "U" qualified for specific VOC.
9. TCE isopleths are based upon individual soil sample results over all depths of sampling.
10. Section 7 of the Final Characterization Report includes explanation of the modeling conducted to establish the TCE contours based upon confidence levels.
11. Source of 2009 Aerial: Williams Aerial & Mapping, Inc.

30 15 0 30 Feet

**SWMU 211-A Soil VOC Results**

Paducah Gaseous Diffusion Plant
Kevil, Kentucky

Geosyntec consultants

Titusville, FL | May 2013

Figure 6

Path: (Titusville-01\Data)\T\GIS\FR5082_Paducah\MXDs\SWMU_211_FEB2013\MAY2013\SWMU_211_A_SS_VOC_Results.mxd 19 Sep 2013 JRB analysis EVS-ES software to contour the 90% confidence limit of 75 µg/kg soil TCE for SWMUs 211-A and 211-B. Figure 6 shows the lateral extent of 75 µg/kg soil TCE (90% confidence limit).

In addition, Figure 6 shows the smaller areas of 75 µg/kg soil TCE (50% confidence limit) and 1,000 µg/kg soil TCE (90% confidence limit) for comparison. These depictions define the extent of TCE contamination.

Total organic carbon (TOC) results for SWMU 211-A ranged from 150 milligram/kilogram (mg/kg) to 650 mg/kg with an average concentration of 396 mg/kg. TOC sample results are presented in Table 7.

**Table 7. Summary of Soils TOC Data for SWMU 211-A**

| Station | Date Collected | Sample Top Depth/Elevation [ft bgs/ft amsl] | Sample Bottom Depth/Elevation [ft bgs/ft amsl] | Hydrologic Unit | TOC [mg/kg] |
|---|---|---|---|---|---|
| 211-A-006 | 9/26/2012 | 15.5/358.59 | 16/358.09 | HU1 | 420 |
| | | 20.5/353.59 | 20.5/353.59 | HU2 | 650 |
| | | 40.5/333.59 | 40.5/333.59 | HU3 | 340 |
| 211-A-010 | 8/16/2012 | 9/365.33 | 9/365.33 | HU1 | 500 |
| | | 19.5/354.83 | 19.5/354.83 | HU2 | 370 |
| | 9/13/2012 | 40/334.33 | 40/334.33 | HU3 | 220 |
| 211-A-012 | 9/17/2012 | 15/360.46 | 16359.46 | HU1 | 400 |
| | | 25/350.46 | 26/349.46 | HU2 | 490 |
| | | 37/338.46 | 38/337.46 | HU3 | 410 |
| 211-A-027 | 9/18/2012 | 14/360.62 | 15/359.62 | HU1 | 530 |
| | | 25/349.62 | 25.5/349.12 | HU2 | 270 |
| | | 36.5/338.12 | 37/337.62 | HU3 | 150 |

## 5.3 GROUNDWATER SAMPLE RESULTS

In the area of SWMU 211-A, RGA groundwater flows to the north and northeast. MW203 (RGA) is screened in the RGA from 71 to 76 ft bgs (298.95 to 303.95 ft amsl) and is located 16 ft upgradient of the defined area of VOC contamination at SWMU 211-A. The results of groundwater samples collected from MW203 represent ambient water quality in the area associated with the eastern half of SWMU 211-A. The prevailing hydraulic gradient in the UCRS is vertically downward, and groundwater in the UCRS is a source of recharge to the RGA. UCRS well MW204, screened from 49 to 54 ft bgs (320.44 to 325.34 ft amsl), is similarly located south (upgradient) of the defined VOC contamination in the east half of SWMU 211-A. Thus, results for MW204, similarly, represent ambient water quality for the investigation analytes. (MW204 water quality is influenced by an unidentified technetium-99 source, up to 1,240 pCi/L.) UCRS wells MW511 (screened 10 to 15 ft bgs/359.03 to 364.03 ft amsl), MW512 (screened 18 to 28 ft bgs, 346.68 to 356.68 ft amsl), and MW513 (screened 37 to 42 ft bgs, 332.20 to 337.02 ft amsl) are located within the eastern half of the area impacted by VOC contamination at SWMU 211-A, crossgradient to the areas of highest soil VOC levels. The groundwater from samples obtained from these wells reflects crossgradient impacts from VOC contamination identified with SWMU 211-A. Currently, there are no monitoring wells located in the western portion of SWMU 211-A or downgradient of SWMU 211-A.

Groundwater samples were collected during September and October 2012 from the MWs noted above: MW203 (RGA), MW204 (UCRS), MW511 (UCRS), MW512 (UCRS), and MW513 (UCRS). The groundwater samples were analyzed for VOCs, alkalinity, total and dissolved metals, ferrous iron, major anions, and dissolved gasses. Additionally, samples from MW511 and MW513 were analyzed for *Dehalococcoides mccartyi* (*Dhc*). Groundwater sample results are presented and are summarized in Table 8. Comparisons of the highest levels detected in the wells installed during the RDSI and the preexisting wells MW203 and MW204 follow.

**VOCs.** In the east half of SWMU 211-A, in the UCRS wells installed during the RDSI, contaminant levels were significantly higher in the deepest well, MW513.

| | **East Half of SWMU 211-A** | **Southeast of SWMU 211-A (Upgradient)** | |
|---|---|---|---|
| | **MW513 (deep UCRS well)** | **MW204 max value (UCRS well)** | **MW203 max value (RGA well)** |
| Trichloroethene (µg/L) | 220 (“D” qualified) | 76 | 110 |
| 1,1-DCE (µg/L) | 810 (“D” qualified) | 17 | 6.7 |
| *cis*-1,2-DCE (µg/L) | 12 | 18 | 29 |

*Trans*-1,2-DCE and VC were not detected above individual laboratory detection limits in any of the SWMU 211-A groundwater samples. The presence of *cis*-1,2-DCE suggests that biologically mediated reductive dechlorination is occurring in the groundwater at SWMU 211-A. Groundwater VOC sample results are displayed in Figure 7.

**Dissolved Gases.** Among the UCRS wells installed for the RDSI at SWMU 211-A, all three dissolved gasses—ethane, ethene, and methane—are highest in the shallow well.

| | **East Half of SWMU 211-A** | **Southeast of SWMU 211-A (Upgradient)** | |
|---|---|---|---|
| | **MW511 (shallow UCRS well)** | **MW204 max value (UCRS well)** | **MW203 max value (RGA well)** |
| Ethane (µg/L) | 0.41 | 0.039 | 0.097 |
| Ethene (µg/L) | 0.32 | 0.1 | 0.49 |
| Methane (µg/L) | 0.86 | 2.6 | 6.8 |

Methane is produced by methanogenic bacteria conversion of acetate or reduction of carbon dioxide under anaerobic conditions. Methanogens and dechlorinating organisms thrive under similar conditions; therefore, the production of methane in groundwater is an indicator that conditions exist that are suitable for reductive dechlorination. Ethene is the final dechlorination product of TCE, while ethane is the product of ethene reduction. The presence of ethene/ethane provides a direct line of evidence that reductive dechlorination is proceeding to completion.

**Inorganic Anions.** Among the wells installed during the RDSI within the area impacted by VOC contamination in the east half of SWMU 211-A, chloride was measured at highest concentration in the deepest UCRS well, MW513, and the highest measured sulfate concentration was measured in the shallowest UCRS well, MW511. Nitrate was undetectable in both wells.

| | **East Half of SWMU 211-A** | | **Southeast of SWMU 211-A (Upgradient)** | |
|---|---|---|---|---|
| | **MW511 (shallow UCRS well)** | **MW513 (deep UCRS well)** | **MW204 max value (UCRS well)** | **MW203 max value (RGA well)** |
| Chloride (mg/L) | 3.9 | 92 | 90 | 120 |
| Nitrate (mg/L) | < 3 | < 3 | 5.4 | 3.6 |
| Sulfate (mg/L) | 66 | 22 | 49 | 17 |

The nitrate and sulfate (electron acceptors) concentrations present are not at levels that would be anticipated to hinder the reductive dechlorination pathway. Additionally, sulfate is not present at an elevated concentration that has the potential to result in sulfide concentrations that are toxic to dechlorinating microorganisms.

**Metals.** Among the UCRS wells installed during the RDSI in the east half of SWMU 211-A, the highest measured levels of aluminum, iron, and lead were found in samples from the shallowest well, MW511; the highest levels of chromium and manganese were found in samples from the deepest well, MW513.

| | **East Half of SWMU 211-A** | | **Southeast of SWMU 211-A (Upgradient)** | |
|---|---|---|---|---|
| | **MW511 (shallow UCRS well)** | **MW513 (deep UCRS well)** | **MW204 max value (UCRS well)** | **MW203 max value (RGA well)** |
| Aluminum (mg/L) | 1.77 (“N” qualified) | < 0.2 (“N” qualified) | 0.736 (“N” qualified) | < 0.2 |
| Chromium (mg/L) | < 0.01 | 0.0409 | 0.284 | 0.202 |
| Iron (mg/L) | 2.35 | 0.77 | 1.96 | 4.99 |
| Lead (mg/L) | 0.00275 | < 0.0013 | 0.00308 | < 0.0013 |
| Manganese | 0.204 (“N” qualified) | 0.282 (“N” qualified) | 0.0357 | 0.209 (“N” qualified) |

**Biological.** *Dhc* was not measured at a concentration greater than the reporting limits of 43 cells/milliliter (cells/mL) in MW511 and 17 cells/mL in MW513. The absence of detectable *Dhc* suggests that reductive dechlorination is not occurring at a high rate under current conditions.

**Table 8. Summary of Groundwater Metals, VOCs, and Dissolved Gases Data for SWMU 211-A**

| Analyte | Date Collected | MW203 | | MW204 | | MW511 | | MW512 | MW513 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Total and Dissolved Metals** | | | | | | | | | | |
| Aluminum (mg/L) | 9/5/2012 | 0.2 | U | 0.64 | | -- | | -- | -- | |
| | 9/12/2012 | 0.2 | U | 0.659 | | -- | | -- | -- | |
| | 10/22/2012 | 0.2 | UN | 0.736 | N | 1.77 | N | -- | 0.2 | UN |
| Aluminum, Dissolved (mg/L) | 9/5/2012 | 0.2 | U | 0.2 | U | -- | | -- | -- | |
| | 9/12/2012 | 0.2 | U | 0.2 | U | -- | | -- | -- | |
| | 10/22/2012 | 0.2 | U | 0.2 | U | 0.2 | U | -- | 0.2 | U |
| Chromium (mg/L) | 9/5/2012 | 0.117 | | 0.261 | | -- | | -- | -- | |
| | 9/12/2012 | 0.114 | | 0.284 | | -- | | -- | -- | |
| | 10/22/2012 | 0.202 | | 0.229 | | 0.01 | U | -- | 0.0409 | |
| Chromium, Dissolved (mg/L) | 9/5/2012 | 0.01 | U | 0.01 | U | -- | | -- | -- | |
| | 9/12/2012 | 0.01 | U | 0.01 | U | -- | | -- | -- | |
| | 10/22/2012 | 0.01 | U | 0.01 | U | 0.01 | U | -- | 0.01 | U |
| Iron (mg/L) | 9/5/2012 | 4.99 | | 1.38 | | -- | | -- | -- | |
| | 9/12/2012 | 4.67 | | 1.62 | | -- | | -- | -- | |
| | 10/22/2012 | 4.73 | | 1.96 | | 2.35 | | -- | 0.77 | |
| Iron, Dissolved (mg/L) | 9/5/2012 | 0.275 | | 0.326 | | -- | | -- | -- | |
| | 9/12/2012 | 0.186 | | 0.177 | | -- | | -- | -- | |
| | 10/22/2012 | 0.404 | | 0.325 | | 0.115 | | -- | 0.1 | U |

**Table 8. Summary of Groundwater Metals, VOCs, and Dissolved Gases Data for SWMU 211-A (Continued)**

| Analyte | Date Collected | MW203 | | MW204 | | MW511 | | MW512 | | MW513 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead (mg/L) | 9/5/2012 | 0.0013 | U | 0.0013 | U | -- | | -- | | -- | |
| | 9/12/2012 | 0.0013 | U | 0.00162 | | -- | | -- | | -- | |
| | 10/22/2012 | 0.0013 | U | 0.00308 | | 0.00275 | | -- | | 0.0013 | U |
| Lead, Dissolved (mg/L) | 9/5/2012 | 0.0013 | UB | 0.0013 | UB | -- | | -- | | -- | |
| | 9/12/2012 | 0.0013 | UB | 0.0013 | UB | -- | | -- | | -- | |
| | 10/22/2012 | 0.0013 | U | 0.0013 | U | 0.0013 | U | -- | | 0.0013 | U |
| Manganese (mg/L) | 9/5/2012 | 0.168 | | 0.0221 | | -- | | -- | | -- | |
| | 9/12/2012 | 0.151 | | 0.0357 | | -- | | -- | | -- | |
| | 10/22/2012 | 0.209 | N | 0.0341 | N | 0.204 | N | -- | | 0.282 | N |
| Manganese, Dissolved (mg/L) | 9/5/2012 | 0.162 | | 0.0228 | | -- | | -- | | -- | |
| | 9/12/2012 | 0.11 | | 0.0175 | | -- | | -- | | -- | |
| | 10/22/2012 | 0.181 | X | 0.0249 | X | 0.203 | X | -- | | 0.248 | X |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| Trichloroethene (µg/L) | 9/5/2012 | 72 | JY | 56 | DJY | -- | | -- | | -- | |
| | 9/12/2012 | 83 | | 61 | | -- | | -- | | -- | |
| | 10/22/2012 | 110 | | 76 | | 10 | | -- | | 220 | D |
| | 10/23/2012 | -- | | -- | | -- | | 34 | | -- | |
| 1,1-Dichloroethene (µg/L) | 9/5/2012 | 6.1 | | 15 | D | -- | | -- | | -- | |
| | 9/12/2012 | 6.5 | | 17 | | -- | | -- | | -- | |
| | 10/22/2012 | 6.7 | | 16 | | 5 | U | -- | | 810 | D |
| | 10/23/2012 | -- | | -- | | -- | | 5 | U | -- | |
| *cis*-1,2-Dichloroethene (µg/L) | 9/5/2012 | 28 | | 17 | D | -- | | -- | | -- | |
| | 9/12/2012 | 29 | | 17 | | -- | | -- | | -- | |
| | 10/22/2012 | 27 | | 18 | | 2.6 | | -- | | 12 | D |
| | 10/23/2012 | -- | | -- | | -- | | 1.2 | | -- | |
| *trans*-1,2-Dichloroethene (µg/L) | 9/5/2012 | 1 | U | 2 | U | -- | | -- | | -- | |
| | 9/12/2012 | 1 | U | 1 | U | -- | | -- | | -- | |
| | 10/22/2012 | 1 | U | 1 | U | 1 | U | -- | | 10 | U |
| | 10/23/2012 | -- | | -- | | -- | | 1 | U | -- | |
| Vinyl chloride (µg/L) | 9/5/2012 | 2 | U | 4 | U | -- | | -- | | -- | |
| | 9/12/2012 | 2 | U | 2 | U | -- | | -- | | -- | |
| | 10/22/2012 | 2 | U | 2 | U | 2 | U | -- | | 20 | U |
| | 10/23/2012 | -- | | -- | | -- | | 2 | U | -- | |
| **Biological** | | | | | | | | | | | |
| *Dehaloccoides ethenogenes* (cells/mL) | 10/22/2012 | -- | | -- | | 43 | U | -- | | 17 | U |
| **Dissolved Gases** | | | | | | | | | | | |
| Ethane (µg/L) | 9/5/2012 | 0.097 | | 0.039 | | -- | | -- | | -- | |
| | 9/18/2012 | 0.02 | J | 0.022 | J | -- | | -- | | -- | |
| | 10/22/2012 | 0.0076 | J | 0.012 | J | 0.41 | | -- | | 0.33 | |
| | 10/23/2012 | -- | | -- | | -- | | 0.03 | | -- | |

**Table 8. Summary of Groundwater Metals, VOCs, and Dissolved Gases Data for SWMU 211-A (Continued)**

| Analyte | Date Collected | MW203 | MW204 | MW511 | MW512 | MW513 |
|---|---|---|---|---|---|---|
| Ethene (µg/L) | 9/5/2012 | 0.49 | 0.1 | -- | -- | -- |
| | 9/18/2012 | 0.034 | 0.031 | -- | -- | -- |
| | 10/22/2012 | 0.026 | 0.02 J | 0.32 | -- | 0.12 |
| | 10/23/2012 | -- | -- | -- | 0.01 J | -- |
| Methane (µg/L) | 9/5/2012 | 6.8 | 2.6 | -- | -- | -- |
| | 9/18/2012 | 0.31 | 0.47 | -- | -- | -- |
| | 10/22/2012 | 0.23 | 0.16 | 0.86 | -- | 1.3 |
| | 10/23/2012 | -- | -- | -- | 0.48 | -- |
| **Inorganic Anions** | | | | | | |
| Chloride (mg/L) | 9/5/2012 | 120 | 88 | -- | -- | -- |
| | 9/12/2012 | 120 | 87 | -- | -- | -- |
| | 10/22/2012 | 110 | 90 | 3.9 | -- | 92 |
| Nitrate (mg/L) | 9/5/2012 | 3.6 | 5.4 | -- | -- | -- |
| | 9/12/2012 | 3.4 | 5.1 | -- | -- | -- |
| | 10/22/2012 | 3.1 | 5.4 | 3 U | -- | 3 U |
| Sulfate (mg/L) | 9/5/2012 | 15 | 49 | -- | -- | -- |
| | 9/12/2012 | 15 | 47 | -- | -- | -- |
| | 10/22/2012 | 17 | 48 | 66 | -- | 22 |

Notes:

1. B—Applies when the analyte is found in the associated blank.
2. D—Compounds identified in an analysis at a secondary dilution filter.
3. J—Indicates an estimated value.
4. N—Sample spike recovery not within control limits.
5. U (inorganics and organics)—Analyte result is less than the reporting limit.
6. X—Other specific flags and footnotes may be required to properly define results. For the dissolved manganese analyses, the serial dilution test difference exceeded the quality control limit of 10%.
7. Y—Matrix spike, matrix spike duplicate and/or relative percent difference failed acceptance criteria.
8. "---"—signifies sample was not collected.
9. The high reporting limits for MW513 for *trans*-1,2- DCE and VC are due to a 10× dilution of the sample.

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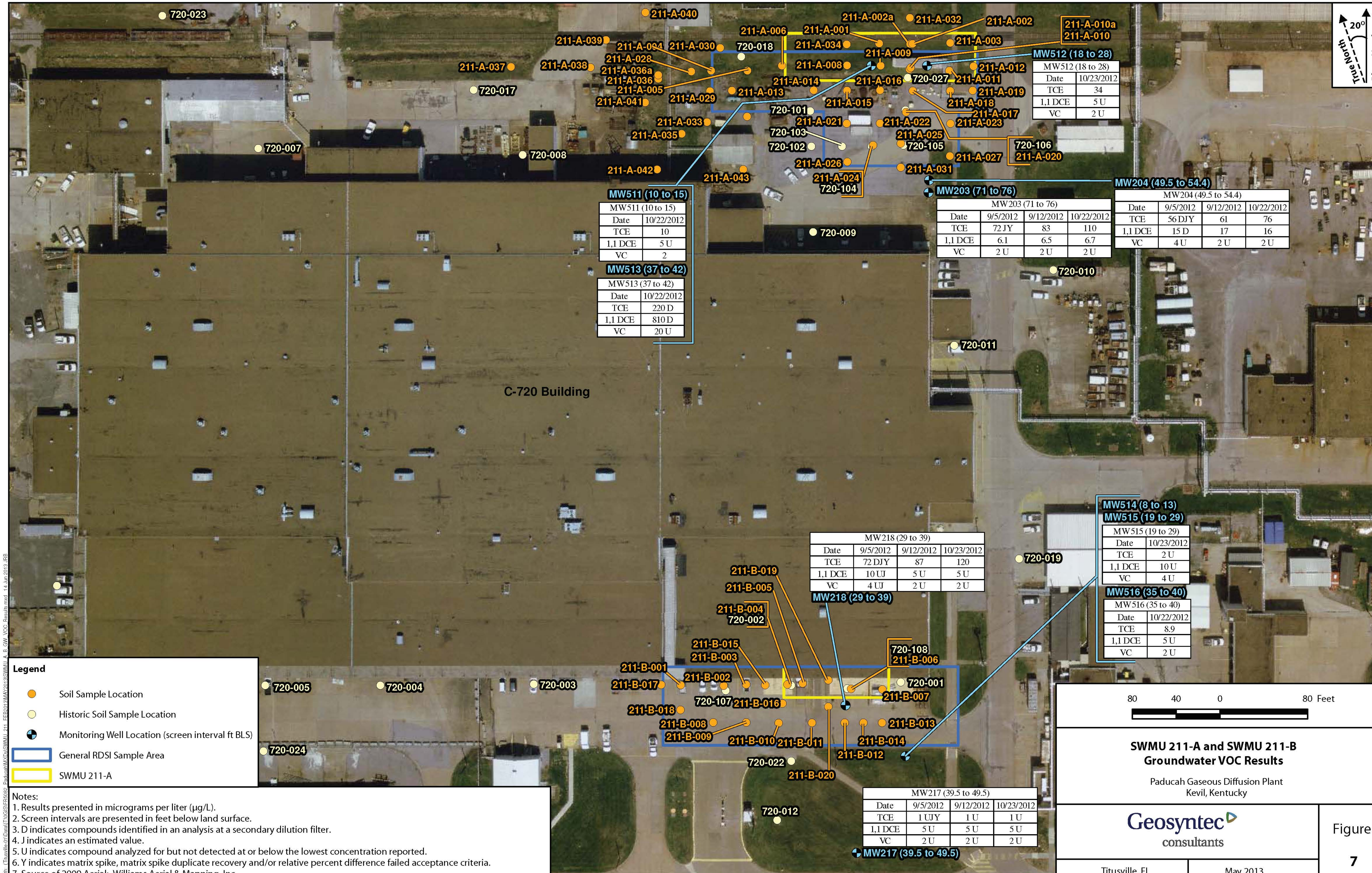


| MW512 (18 to 28) | |
|---|---|
| Date | 10/23/2012 |
| TCE | 34 |
| 1,1 DCE | 5 U |
| VC | 2 U |

| MW511 (10 to 15) | |
|---|---|
| Date | 10/22/2012 |
| TCE | 10 |
| 1,1 DCE | 5 U |
| VC | 2 |

| MW513 (37 to 42) | |
|---|---|
| Date | 10/22/2012 |
| TCE | 220 D |
| 1,1 DCE | 810 D |
| VC | 20 U |

| MW203 (71 to 76) | | | |
|---|---|---|---|
| Date | 9/5/2012 | 9/12/2012 | 10/22/2012 |
| TCE | 72 JY | 83 | 110 |
| 1,1 DCE | 6.1 | 6.5 | 6.7 |
| VC | 2 U | 2 U | 2 U |

| MW204 (49.5 to 54.4) | | | |
|---|---|---|---|
| Date | 9/5/2012 | 9/12/2012 | 10/22/2012 |
| TCE | 56 DJY | 61 | 76 |
| 1,1 DCE | 15 D | 17 | 16 |
| VC | 4 U | 2 U | 2 U |

| MW218 (29 to 39) | | | |
|---|---|---|---|
| Date | 9/5/2012 | 9/12/2012 | 10/23/2012 |
| TCE | 72 DJY | 87 | 120 |
| 1,1 DCE | 10 UJ | 5 U | 5 U |
| VC | 4 UJ | 2 U | 2 U |

| MW515 (19 to 29) | |
|---|---|
| Date | 10/23/2012 |
| TCE | 2 U |
| 1,1 DCE | 10 U |
| VC | 4 U |

| MW516 (35 to 40) | |
|---|---|
| Date | 10/22/2012 |
| TCE | 8.9 |
| 1,1 DCE | 5 U |
| VC | 2 U |

| MW217 (39.5 to 49.5) | | | |
|---|---|---|---|
| Date | 9/5/2012 | 9/12/2012 | 10/23/2012 |
| TCE | 1 UJY | 1 U | 1 U |
| 1,1 DCE | 5 U | 5 U | 5 U |
| VC | 2 U | 2 U | 2 U |

Notes:
1. Results presented in micrograms per liter (µg/L).
2. Screen intervals are presented in feet below land surface.
3. D indicates compounds identified in an analysis at a secondary dilution filter.
4. J indicates an estimated value.
5. U indicates compound analyzed for but not detected at or below the lowest concentration reported.
6. Y indicates matrix spike, matrix spike duplicate recovery and/or relative percent difference failed acceptance criteria.
7. Source of 2009 Aerial: Williams Aerial & Mapping, Inc.

**Figure 7. SWMU 211-A and SWMU 211-B Groundwater VOC Data**

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## 5.4 SWMU 211-A HU HYDROLOGIC ANALYSIS

Both field and laboratory evaluations were performed to assess the ability of the HU1, HU2, and HU3 formations to accept injectate (Appendix F) and to predict the likely injection pressures and flow rates that may be encountered during field implementation of an injection remedy. Table 9 presents the results of the flexible wall permeameter tests and injection tests. One of the geotechnical laboratory tests estimated hydraulic conductivity by use of a flexible wall permeameter test (ASTM D5084-10) performed at nine locations:

- 211-A-012 (10-12 ft bgs/363.46 to 365.46 ft amsl), 211-A-012 (23-25 ft bgs/350.46 to 352.46 ft amsl), 211-A-012 (38-40 ft bgs/335.46 to 337.46 ft amsl)

- 211-A-027 (10-12 ft bgs/362.62 to 364.62 ft amsl), 211-A-027 (22.5-24.5 ft bgs/350.12 to 352.12 ft amsl), 211-A-027 (38-40 ft bgs/334.62 to 336.62 ft amsl)

- MW513 (10-12 ft bgs/362.02 to 364.02 ft amsl), MW513 (20-21 ft bgs/353.02 to 354.02 ft amsl), MW513 (40-42 ft bgs/332.02 to 334.02 ft amsl)

The calculated average hydraulic conductivity values ranged from 5.5E-10 cm/s to 3.8E-7 cm/s.

Injection test results provided estimates of the likely injection pressures and flow rates during performance of an injection-based remedy. MW511, MW512, and MW513 were tested at pressures of 25, 50, 75, and 100 pounds per square inch (psi) while the flow rate was recorded. The injection flow rates and pressures were used as inputs to calculate hydraulic conductivity by the Jacob-Lohman Method, as provided by the U.S. Geological Survey (USGS 2002). The Jacob-Lohman method calculated hydraulic conductivity values ranged from 4.2E-6 cm/s to 8.8E-5 cm/s. Based upon field observations injection pressures in excess of 50 psi and a flow rate greater than 2 gallons per minute (gpm) are not advisable. Pressures greater than 50 psi tended to raise the immediate groundwater level to the ground surface, signifying that the aquifer is over pressurized and will not provide optimum horizontal distribution within the target HU.

**Table 9. Summary of Hydrologic Unit Hydraulic Conductivities for SWMU 211-A**

| Permeameter Test Result Summary | | | |
|---|---|---|---|
| **Boring Location** | **Hydrologic Unit** | **Sample Depth/Elevation Interval (ft bgs/ft/amsl)** | **Average Vertical Hydraulic Conductivity (cm/s)** |
| 211-A-012 | HU1 | 10-12/363.46-365.46 | 1.2E-08 |
| 211-A-012 | HU2 | 23-25/350.46-352.46 | 3.5E-09 |
| 211-A-012 | HU3 | 38-40/335.46-337.46 | 3.8E-09 |
| 211-A-027 | HU1 | 10-12/362.62-364.62 | 2.0E-08 |
| 211-A-027 | HU2 | 22.5-24.5/350.12-352.12 | 3.9E-09 |
| 211-A-027 | HU3 | 38-40/334.62-336.62 | 4.8E-09 |
| MW513 | HU1 | 10-12/362.02-364.02 | 3.8E-07 |
| MW513 | HU2 | 20-21/353.02-354,02 | 5.5E-10 |
| MW513 | HU3 | 40-42/332,02-334,02 | 1.8E-07 |

**Table 9. Summary of Hydrologic Unit Hydraulic Conductivities for SWMU 211-A (Continued)**

| Injection Test Result Summary | | | | |
|---|---|---|---|---|
| **Monitoring Well** | **Hydrologic Unit** | **Injection Pressure (psi)** | **Average Flow Rate (gpm)** | **Calculated Horizontal Hydraulic Conductivity (cm/s)** |
| MW511 | HU1 | 25 | 2.3 | 8.8E-05 |
| MW511 | HU1 | 50 | 3.1 | 4.2E-05 |
| MW511 | HU1 | 75 | 3.9 | 2.6E-05 |
| MW511 | HU1 | 100 | 4.8 | 1.9E-05 |
| MW512 | HU2 | 25 | 2.0 | 2.9E-05 |
| MW512 | HU2 | 50 | 3.3 | 1.5E-05 |
| MW512 | HU2 | 75 | 4.1 | 9.9E-06 |
| MW512 | HU2 | 100 | 4.7 | 7.4E-06 |
| MW513 | HU3 | 25 | 0.9 | 1.3E-05 |
| MW513 | HU3 | 50 | 2.0 | 6.4E-06 |
| MW513 | HU3 | 75 | 3.0 | 4.2E-06 |

A laboratory evaluation of soil samples was performed to obtain soil grain size distribution (GSD) information (see Appendix F). GSD analyses (ASTM D422) were performed at the following locations:

- 211-A-006 (12-15.5 ft bgs/358.59-362.09 ft amsl), 211-A-006 (21.3-25 ft bgs/349.09-352.79 ft amsl), 211-A-006 (40-42.5 ft bgs/331.59-334.09 ft amsl)

- 211-A-002 (9-13 ft bgs/361.50-365.50 ft amsl), 211-A-002 (23-26 ft bgs/348.50-351.50 ft amsl)), 211-A-002 (37.4-39 ft bgs/335.50-337.10 ft amsl)

- 211-A-012 (12-15 ft bgs/360.46-363.46 ft amsl), 211-A-012 (20-23 ft bgs/352.46-355.46 ft amsl), 211-A-012 (40-42 ft bgs/333,46-335,46 ft amsl)

- 211-A-027 (12-15 ft bgs/359.62-362.62 ft amsl), 211-A-027 (22-25 ft bgs/349.62-352.62 ft amsl), 211-A-027 (35.5-37 ft bgs/337.62-339.12 ft amsl)

Overall, the GSD results indicate that injection technologies would be expected to be successful (though limited in rate/pressure due to grain size) at SWMU 211-A.

# 6. SWMU 211-B RDSI SAMPLE RESULTS

## 6.1 LITHOLOGY

Soil lithology logs that provide a detailed description of soil type and HU transitions are included in Appendix D. Within the SWMU 211-B investigation area, lithology logs reveal the presence of fill material (gravelly fine sand) to a typical depth of approximately 2 ft, underlain primarily by silt with very fine sand representing HU1 to a typical depth of approximately 20 ft bgs. HU2 was identified from approximately 20 ft bgs to approximately 35 ft bgs and consisted primarily of fine sand and silt with some gravel. HU3 was identified from approximately 35 ft bgs to 60 ft bgs and consisted primarily of silt with fine sand and clay.

## 6.2 SOIL SAMPLING RESULTS

Nineteen DPT soil boring locations (17 original and 2 contingency) (Figure 5) were performed on the parking lot south of the southeastern portion of the C-720 Building. Collected soil samples were screened approximately every 0.5 ft using a PID to identify intervals of maximum organic vapor response, if present. Soil samples were collected from the 0.5 ft interval of maximum PID reading for each 5-ft soil core and sent by courier to the fixed-base laboratory for overnight VOC analysis. The laboratory preliminary analytical results were available by 8:30 a.m. on Monday for samples collected on the previous Friday and by 8:30 a.m. Tuesday through Friday for samples collected the previous day. The next day laboratory results were used to actively assess whether additional borings were needed based upon a comparison to the RDWP (DOE 2012a) remediation goals. As a result, two contingency borings were completed.

A total of 256 soil samples were collected from 19 soil boring locations. The soil sample VOC results are summarized in Table 10 and presented in Appendix G. Soil sample depths ranged from 0.5 ft bgs (370.07 ft amsl) to 64.9 ft bgs (306.42 ft amsl). The maximum measured TCE result was 13,000 µg/kg from location 211-B-019 at a depth of 25.1 ft bgs (346.90 ft amsl). The observed maximum *cis*-1,2-DCE result was 66 µg/kg (“J” qualified) collected at soil boring location 211-B-004, at a depth of 14.5 ft bgs (357.44 ft amsl). Soil boring locations 211-B-019 and 211-B-004 are located centrally in the investigation area and within 35 ft of historical location 720-002 (location with greatest TCE concentrations from the Southwest Plume SI). 1,1-DCE, *trans*-1,2-DCE, and VC were not detected in the collected soil samples above laboratory detection limits. At four borings (21%), the borehole average concentration[6] exceeded the remediation goal. A total of 40 soil samples (16%) exceeded the remediation goal. In general, the highest concentrations were noted in the 15 to 30 ft bgs depth range. The area with remediation goal exceedances is immediately adjacent to the southern limit of the eastern portion of the C-720 Building.

Figure 8 illustrates all of the soil TCE analyses for the SWMU 211-B investigation area, overlaid on a map. For reference, soil TCE analyses greater than 75 µg/kg (the borehole average project remediation goal) are noted by yellow highlight. As discussed in Section 5.2, Figure 8 shows the lateral extent of 75 µg/kg soil TCE (90% confidence limit) and the smaller areas of 75 µg/kg soil TCE (50% confidence limit) and 1,000 µg/kg soil TCE (90% confidence limit) for comparison.

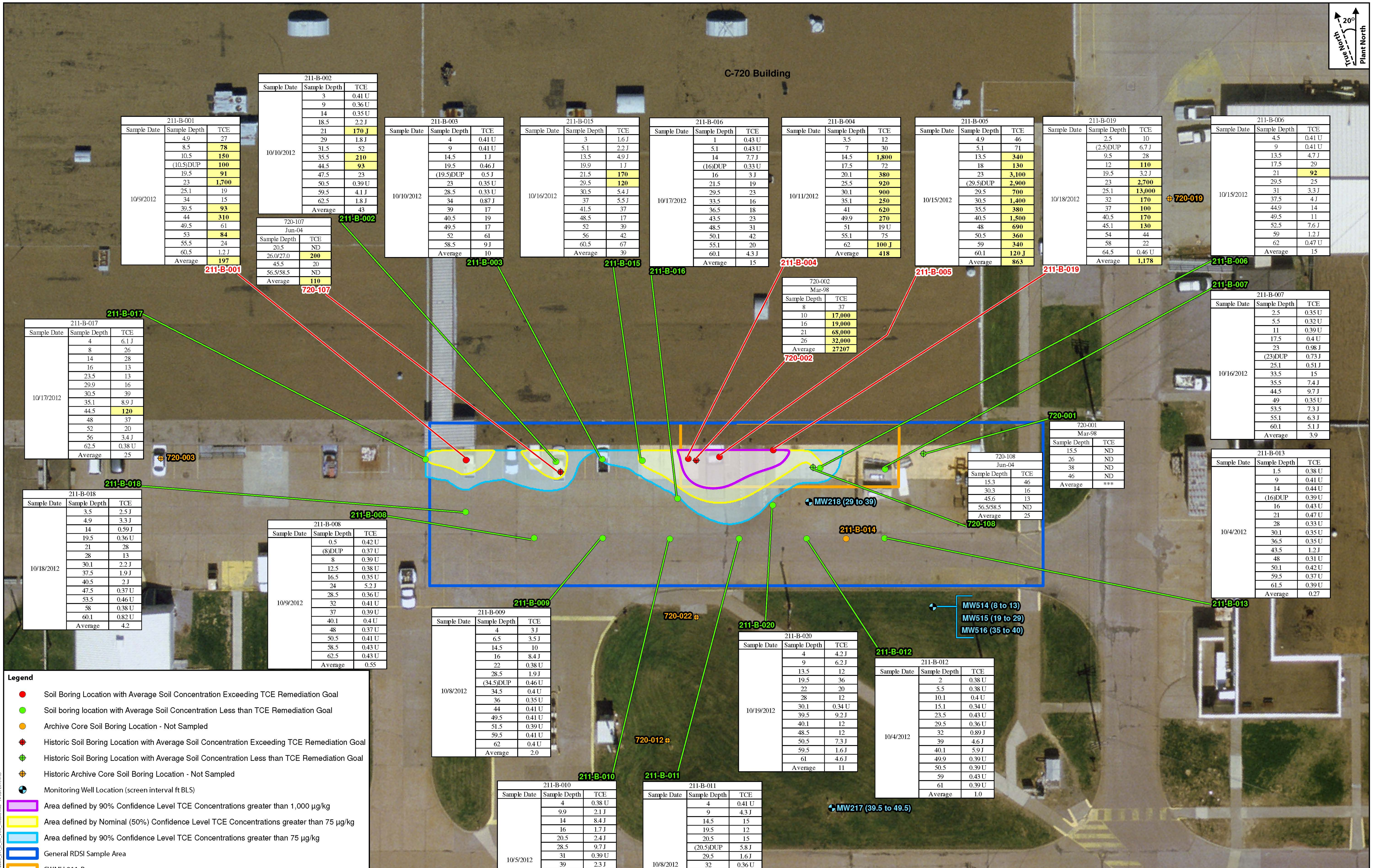
[6] The average contaminant concentration for a borehole was calculated using one half of the laboratory reporting limit for nondetect analyses and using the greater concentration where analyses of duplicate samples were available.

**Table 10. Soils VOC Data (Average Borehole Concentration) for SWMU 211-B**

| Station | Date Collected | TCE [µg/kg] | 1,1-DCE [µg/kg] | *cis*-1,2-DCE [µg/kg] | *trans*-1,2-DCE [µg/kg] | VC [µg/kg] |
|---|---|---|---|---|---|---|
| **Groundwater Protection Remediation Goal** | | **75** | **137** | **619** | **5290** | **570** |
| 211-B-001 | 10/9/2012 | **197** | *** | 1 | *** | *** |
| 211-B-002 | 10/10/2012 | 43* | *** | *** | *** | *** |
| 211-B-003 | 10/10/2012 | 10 | *** | *** | *** | *** |
| 211-B-004 | 10/11/2012 | **418** | *** | 10 | *** | *** |
| 211-B-005 | 10/15/2012 | **863** | *** | 6 | *** | *** |
| 211-B-006 | 10/15/2012 | 15* | *** | *** | *** | *** |
| 211-B-007 | 10/16/2012 | 4 | *** | *** | *** | *** |
| 211-B-008 | 10/9/2012 | 0.6 | *** | *** | *** | *** |
| 211-B-009 | 10/8/2012 | 2 | *** | 0.3 | *** | *** |
| 211-B-010 | 10/5/2012 | 3 | *** | 0.3 | *** | *** |
| 211-B-011 | 10/8/2012 | 5 | *** | *** | *** | *** |
| 211-B-012 | 10/4/2012 | 1.0 | *** | *** | *** | *** |
| 211-B-013 | 10/4/2012 | 0.3 | *** | *** | *** | *** |
| 211-B-015 | 10/16/2012 | 39* | *** | 2 | *** | *** |
| 211-B-016 | 10/17/2012 | 15 | *** | 0.4 | *** | *** |
| 211-B-017 | 10/17/2012 | 25* | *** | 0.6 | *** | *** |
| 211-B-018 | 10/18/2012 | 4 | *** | *** | *** | *** |
| 211-B-019 | 10/18/2012 | **1,178** | *** | 4 | *** | *** |
| 211-B-020 | 10/19/2012 | 11 | *** | *** | *** | *** |

Notes:

1. Groundwater Protection Remediation Goals from *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2012a).
2. *—Indicates average concentrations that are below the Groundwater Protection Remediation Goal, but at least one sample exceeded the remediation goal.
3. ***—Indicates average concentration not calculated as all boring analyses were "U" qualified (compound analyzed for but not detected at or below the lowest concentration reported) for specific VOC.
4. For "U" qualified analyses, a value of one half the concentration reported was used in calculating the average borehole concentration.
5. Yellow shading and bold text indicate an exceedance of Groundwater Protection Remediation Goals.
6. Soil boring 211-B-014 was collected and archived. Boring was not logged or screened for VOC impacts.




**211-B-001**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/9/2012 | 4.9 | 27 |
| | 8.5 | **78** |
| | 10.5 | **150** |
| | (10.5)DUP | **100** |
| | 19.5 | **91** |
| | 23 | **1,700** |
| | 25.1 | 19 |
| | 34 | 15 |
| | 39.5 | **93** |
| | 44 | **310** |
| | 49.5 | 61 |
| | 53 | **84** |
| | 55.5 | 24 |
| | 60.5 | 1.2 J |
| | Average | **197** |

**211-B-002**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/10/2012 | 3 | 0.41 U |
| | 9 | 0.36 U |
| | 14 | 0.35 U |
| | 18.5 | 2.2 J |
| | 21 | **170 J** |
| | 29 | 1.8 J |
| | 31.5 | 52 |
| | 35.5 | **210** |
| | 44.5 | **93** |
| | 47.5 | 23 |
| | 50.5 | 0.39 U |
| | 59.5 | 4.1 J |
| | 62.5 | 1.8 J |
| | Average | 43 |

**720-107**

Jun-04

| Sample Depth | TCE |
|---|---|
| 20.5 | ND |
| 26.0/27.0 | **200** |
| 45.5 | 20 |
| 56.5/58.5 | ND |
| Average | **110** |

**211-B-003**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/10/2012 | 4 | 0.41 U |
| | 9 | 0.41 U |
| | 14.5 | 1 J |
| | 19.5 | 0.46 J |
| | (19.5)DUP | 0.5 J |
| | 23 | 0.35 U |
| | 28.5 | 0.33 U |
| | 34 | 0.87 J |
| | 39 | 17 |
| | 40.5 | 19 |
| | 49.5 | 17 |
| | 52 | 61 |
| | 58.5 | 9 J |
| | Average | 10 |

**211-B-015**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/16/2012 | 3 | 1.6 J |
| | 5.1 | 2.2 J |
| | 13.5 | 4.9 J |
| | 19.9 | 1 J |
| | 21.5 | **170** |
| | 29.5 | **120** |
| | 30.5 | 5.4 J |
| | 37 | 5.5 J |
| | 41.5 | 37 |
| | 48.5 | 17 |
| | 52 | 39 |
| | 56 | 42 |
| | 60.5 | 67 |
| | Average | 39 |

**211-B-016**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/17/2012 | 1 | 0.43 U |
| | 5.1 | 0.43 U |
| | 14 | 7.7 J |
| | (16)DUP | 0.33 U |
| | 16 | 3 J |
| | 21.5 | 19 |
| | 29.5 | 23 |
| | 33.5 | 16 |
| | 36.5 | 18 |
| | 43.5 | 23 |
| | 48.5 | 31 |
| | 50.1 | 42 |
| | 55.1 | 20 |
| | 60.1 | 4.3 J |
| | Average | 15 |

**211-B-004**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/11/2012 | 3.5 | 12 |
| | 7 | 30 |
| | 14.5 | **1,800** |
| | 17.5 | 72 |
| | 20.1 | **380** |
| | 25.5 | **920** |
| | 30.1 | **900** |
| | 35.1 | **250** |
| | 41 | **620** |
| | 49.9 | **270** |
| | 51 | 19 U |
| | 55.1 | 75 |
| | 62 | **100 J** |
| | Average | **418** |

**720-002**

Mar-98

| Sample Depth | TCE |
|---|---|
| 8 | 37 |
| 10 | **17,000** |
| 16 | **19,000** |
| 21 | **68,000** |
| 26 | **32,000** |
| Average | **27207** |

**211-B-005**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/15/2012 | 4.9 | 46 |
| | 5.1 | 71 |
| | 13.5 | **340** |
| | 18 | **130** |
| | 23 | **3,100** |
| | (29.5)DUP | **2,900** |
| | 29.5 | **700** |
| | 30.5 | **1,400** |
| | 35.5 | **380** |
| | 40.5 | **1,500** |
| | 48 | **690** |
| | 50.5 | **360** |
| | 59 | **340** |
| | 60.1 | **120 J** |
| | Average | **863** |

**211-B-019**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/18/2012 | 2.5 | 10 |
| | (2.5)DUP | 6.7 J |
| | 9.5 | 28 |
| | 12 | **110** |
| | 19.5 | 3.2 J |
| | 23 | **2,700** |
| | 25.1 | **13,000** |
| | 32 | **170** |
| | 37 | **100** |
| | 40.5 | **170** |
| | 45.1 | **130** |
| | 54 | 44 |
| | 58 | 22 |
| | 64.5 | 0.46 U |
| | Average | **1,178** |

**211-B-006**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/15/2012 | 4.5 | 0.41 U |
| | 9 | 0.41 U |
| | 13.5 | 4.7 J |
| | 17.5 | 29 |
| | 21 | **92** |
| | 29.5 | 25 |
| | 31 | 3.3 J |
| | 37.5 | 4 J |
| | 44.9 | 14 |
| | 49.5 | 11 |
| | 52.5 | 7.6 J |
| | 59 | 1.2 J |
| | 62 | 0.47 U |
| | Average | 15 |

**211-B-017**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/17/2012 | 4 | 6.1 J |
| | 8 | 26 |
| | 14 | 28 |
| | 16 | 13 |
| | 23.5 | 13 |
| | 29.9 | 16 |
| | 30.5 | 39 |
| | 35.1 | 8.9 J |
| | 44.5 | **120** |
| | 48 | 37 |
| | 52 | 20 |
| | 56 | 3.4 J |
| | 62.5 | 0.38 U |
| | Average | 25 |

**211-B-018**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/18/2012 | 3.5 | 2.5 J |
| | 4.9 | 3.3 J |
| | 14 | 0.59 J |
| | 19.5 | 0.36 U |
| | 21 | 28 |
| | 28 | 13 |
| | 30.1 | 2.2 J |
| | 37.5 | 1.9 J |
| | 40.5 | 2 J |
| | 47.5 | 0.37 U |
| | 53.5 | 0.46 U |
| | 58 | 0.38 U |
| | 60.1 | 0.82 U |
| | Average | 4.2 |

**211-B-008**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/9/2012 | 0.5 | 0.42 U |
| | (8)DUP | 0.37 U |
| | 8 | 0.39 U |
| | 12.5 | 0.38 U |
| | 16.5 | 0.35 U |
| | 24 | 5.2 J |
| | 28.5 | 0.36 U |
| | 32 | 0.41 U |
| | 37 | 0.39 U |
| | 40.1 | 0.4 U |
| | 48 | 0.37 U |
| | 50.5 | 0.41 U |
| | 58.5 | 0.43 U |
| | 62.5 | 0.43 U |
| | Average | 0.55 |

**211-B-009**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/8/2012 | 4 | 3 J |
| | 6.5 | 3.5 J |
| | 14.5 | 10 |
| | 16 | 8.4 J |
| | 22 | 0.38 U |
| | 28.5 | 1.9 J |
| | (34.5)DUP | 0.46 U |
| | 34.5 | 0.4 U |
| | 36 | 0.35 U |
| | 44 | 0.41 U |
| | 49.5 | 0.41 U |
| | 51.5 | 0.39 U |
| | 59.5 | 0.41 U |
| | 62 | 0.4 U |
| | Average | 2.0 |

**720-108**

Jun-04

| Sample Depth | TCE |
|---|---|
| 15.3 | 46 |
| 30.3 | 16 |
| 45.6 | 13 |
| 56.5/58.5 | ND |
| Average | 25 |

**720-001**

Mar-98

| Sample Depth | TCE |
|---|---|
| 15.5 | ND |
| 26 | ND |
| 38 | ND |
| 46 | ND |
| Average | *** |

**211-B-007**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/16/2012 | 2.5 | 0.35 U |
| | 5.5 | 0.32 U |
| | 11 | 0.39 U |
| | 17.5 | 0.4 U |
| | 23 | 0.98 J |
| | (23)DUP | 0.73 J |
| | 25.1 | 0.51 J |
| | 33.5 | 15 |
| | 35.5 | 7.4 J |
| | 44.5 | 9.7 J |
| | 49 | 0.35 U |
| | 53.5 | 7.3 J |
| | 55.1 | 6.3 J |
| | 60.1 | 5.1 J |
| | Average | 3.9 |

**211-B-013**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/4/2012 | 1.5 | 0.38 U |
| | 9 | 0.41 U |
| | 14 | 0.44 U |
| | (16)DUP | 0.39 U |
| | 16 | 0.43 U |
| | 21 | 0.47 U |
| | 28 | 0.33 U |
| | 30.1 | 0.35 U |
| | 36.5 | 0.35 U |
| | 43.5 | 1.2 J |
| | 48 | 0.31 U |
| | 50.1 | 0.42 U |
| | 59.5 | 0.37 U |
| | 61.5 | 0.39 U |
| | Average | 0.27 |

**211-B-020**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/19/2012 | 4 | 4.2 J |
| | 9 | 6.2 J |
| | 13.5 | 12 |
| | 19.5 | 36 |
| | 22 | 20 |
| | 28 | 12 |
| | 30.1 | 0.34 U |
| | 39.5 | 9.2 J |
| | 40.1 | 12 |
| | 48.5 | 12 |
| | 50.5 | 7.3 J |
| | 59.5 | 1.6 J |
| | 61 | 4.6 J |
| | Average | 11 |

**211-B-012**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/4/2012 | 2 | 0.38 U |
| | 5.5 | 0.38 U |
| | 10.1 | 0.4 U |
| | 15.1 | 0.34 U |
| | 23.5 | 0.43 U |
| | 29.5 | 0.36 U |
| | 32 | 0.89 J |
| | 39 | 4.6 J |
| | 40.1 | 5.9 J |
| | 49.9 | 0.39 U |
| | 50.5 | 0.39 U |
| | 59 | 0.43 U |
| | 61 | 0.39 U |
| | Average | 1.0 |

**211-B-010**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/5/2012 | 4 | 0.38 U |
| | 9.9 | 2.1 J |
| | 14 | 8.4 J |
| | 16 | 1.7 J |
| | 20.5 | 2.4 J |
| | 28.5 | 9.7 J |
| | 31 | 0.39 U |
| | 39 | 2.3 J |
| | 41 | 3.2 J |
| | 46 | 3 J |
| | 51.5 | 4 J |
| | 59.5 | 1.7 J |
| | 62 | 0.62 J |
| | Average | 3.0 |

**211-B-011**

| Sample Date | Sample Depth | TCE |
|---|---|---|
| 10/8/2012 | 4 | 0.41 U |
| | 9 | 4.3 J |
| | 14.5 | 15 |
| | 19.5 | 12 |
| | 20.5 | 15 |
| | (20.5)DUP | 5.8 J |
| | 29.5 | 1.6 J |
| | 32 | 0.36 U |
| | 39 | 0.84 J |
| | 44 | 1.5 J |
| | 45.1 | 2.4 J |
| | 51 | 2.2 J |
| | 59 | 0.39 U |
| | 64.9 | 2 J |
| | Average | 4.5 |

**Legend**

- Soil Boring Location with Average Soil Concentration Exceeding TCE Remediation Goal
- Soil boring location with Average Soil Concentration Less than TCE Remediation Goal
- Archive Core Soil Boring Location - Not Sampled
- Historic Soil Boring Location with Average Soil Concentration Exceeding TCE Remediation Goal
- Historic Soil Boring Location with Average Soil Concentration Less than TCE Remediation Goal
- Historic Archive Core Soil Boring Location - Not Sampled
- Monitoring Well Location (screen interval ft BLS)
- Area defined by 90% Confidence Level TCE Concentrations greater than 1,000 µg/kg
- Area defined by Nominal (50%) Confidence Level TCE Concentrations greater than 75 µg/kg
- Area defined by 90% Confidence Level TCE Concentrations greater than 75 µg/kg
- General RDSI Sample Area
- SWMU 211-B

| Groundwater Protection Remediation Goals | | |
|---|---|---|
| Parameter | Abbreviation | UCRS Soil Cleanup Level (µg/kg) |
| Trichloroethene | TCE | 75 |

| Contour (µg/kg) | Total Area (ft²) | Area (ft²) Exclusive |
|---|---|---|
| 90% CL 75 | 3,000 | 2,000 |
| Nominal 75 | 1,600 | 1,000 |
| 90% CL 1000 | 600 | 600 |

Notes:
1. Results are presented in microgram per kilogram (µg/kg).
2. Sample depth is presented in feet below land surface (ft BLS).
3. DUP indicates duplicate sample.
4. J indicates an estimated value.
5. U indicates compound analyzed for but not detected at or below the lowest concentration reported.
6. ND indicates non-detect.
7. Yellow shaded, bold text indicates an exceedance of the Groundwater Protection Remediation Goal Soil Cleanup Level for Trichloroethene (TCE) of 75 µg/kg.
8. TCE isopleths are based upon EVS-ES modeling.
9. Section 7 of the Final Characterization Report includes explanation of the modeling conducted to establish the TCE contours based upon confidence levels.
10. Source of 2009 Aerial: Williams Aerial & Mapping, Inc.

Path: (Titusville-01\Data\)T:\GIS\FR5082_Paducah\MXDs\SWMU_211_FEB2013\MAY2013\SWMU_211_B_SS_VOC_Results.mxd

**SWMU 211-B Soil TCE Results**

Paducah Gaseous Diffusion Plant
Kevil, Kentucky

Geosyntec consultants

Titusville, FL | May 2013

Figure 8

TOC results for SWMU 211-B ranged from lower than the reporting limit of 33 mg/kg to 670 mg/kg with an average concentration of 500 mg/kg. TOC sample results are presented in Table 11.

**Table 11. Summary of Soils TOC Data for SWMU 211-B**

| Station | Date Collected | Sample Top Depth/Elevation [ft bgs/ft amsl] | Sample Bottom Depth/Elevation [ft bgs/ft amsl] | Hydrogeologic Unit | TOC [mg/kg] | |
|---|---|---|---|---|---|---|
| 211-B-001 | 10/9/2012 | 9.5/362.42 | 9.5/362.42 | HU1 | 430 | |
| | | 18.5/353.42 | 18.5/353.42 | HU2 | 460 | |
| | | 39/332.92 | 39/332.92 | HU3 | 380 | |
| 211-B-004 | 10/11/2012 | 5.5/366.44 | 5.5/366.44 | HU1 | 620 | |
| | | 22.3/349.64 | 22.3/349.64 | HU2 | 33 | U |
| | | 38/333.94 | 38/333.94 | HU3 | 450 | |
| 211-B-007 | 10/16/2012 | 9/363.03 | 9/363.03 | HU1 | 670 | |
| | | 27.5/344.53 | 27.5/344.53 | HU2 | 240 | |
| | | 43/329.03 | 43/329.03 | HU3 | 750 | |

## 6.3 GROUNDWATER SAMPLE RESULTS

As at SWMU 211-A, RGA groundwater flows to the north and northeast in the area of SWMU 211-B. Because of the proximity of the Porters Creek Clay Terrace, there are no RGA MWs present in the vicinity of SWMU 211-B to characterize groundwater quality. The prevailing hydraulic gradient in the UCRS is vertically downward and groundwater flows downward to recharge the RGA. UCRS wells MW217 (distal), screened from 40 to 50 ft bgs/325.96 to 335.96 ft amsl, and MW218 (proximal), with screen at 29 to 39 ft bgs/333.30 to 343.30 ft amsl, are located 130 ft and 8 ft south (upgradient) of SWMU 211-B, respectively, and provide ambient groundwater quality characterization for the investigation. UCRS wells MW514 (screened 8 to 13 ft bgs/359.73 to 364.73 ft amsl), MW515 (screened 19 to 29 ft bgs/343.75 to 353.75 ft amsl), and MW516 (screened 35 to 40 ft bgs/332.77 to 337.77 ft amsl) were installed southeast (upgradient) of the area of VOC contamination as part of the RDSI to provide further characterization for SWMU 211-B. (Continued use of the SWMU 211-B area precluded installation of MWs in the VOC contaminated area.) There are no UCRS or RGA downgradient monitoring wells for SWMU 211-B.

Groundwater samples were collected during September and October 2012 from UCRS MWs MW217, MW218, MW515, and MW516. MW514 (shallowest UCRS well) had insufficient water to support groundwater sampling. The groundwater samples were collected and analyzed for VOCs, alkalinity, total and dissolved metals, ferrous iron, major anions, and dissolved gasses. Additionally, samples from MW515 and MW516 were analyzed for *Dhc*. Groundwater sample results are presented in Table 12. Comparisons of the highest levels detected in the wells installed during the RDSI and the levels observed in pre-existing wells MW217 and MW218 follow.

**VOCs.** In the RDSI wells installed for SWMU 211-B, the only detection of a VOC was in the deepest well, MW516.

| | SWMU 211-B RDSI Well | South of SWMU 211-B | |
|---|---|---|---|
| | **MW516 (deep UCRS well)** | **MW217 max value (distal UCRS well)** | **MW218 max value (proximal UCRS well)** |
| Trichloroethene (µg/L) | 8.9 | < 1 | 120 |
| *cis*-1,2-DCE (µg/L) | < 1 | < 1 | 2.2 |

1,1-DCE; *trans*-1,2-DCE; and VC were not detected above individual laboratory detection limits in any of the SWMU 211-B groundwater samples. The presence of *cis*-1,2-DCE suggests that biologically mediated reductive dechlorination is occurring in the groundwater at SWMU 211-B. Groundwater VOC sample results are displayed in Figure 7.

**Dissolved Gases.** Among the wells installed during the RDSI at SWMU 211-B, all three dissolved gasses—ethane, ethene, and methane—are highest in the shallower well with water.

| | SWMU 211-B RDSI Well | South of SWMU 211-B | |
|---|---|---|---|
| | **MW515 (shallower UCRS well)** | **MW217 max value (distal UCRS well)** | **MW218 max value (proximal UCRS well)** |
| Ethane (µg/L) | 25 | 0.11 | 0.18 |
| Ethene (µg/L) | 7.9 | 0.14 | 0.24 |
| Methane (µg/L) | 35 | 6.5 | 2.4 |

Methane is produced by methanogenic bacteria conversion of acetate or reduction of carbon dioxide under anaerobic conditions. Methanogens and dechlorinating organisms thrive under similar conditions; therefore, the production of methane in groundwater is an indicator that conditions exist that are suitable for reductive dechlorination. Ethene is the final dechlorination product of TCE, while ethane is the product of ethene reduction. The presence of ethene/ethane provides a direct line of evidence that reductive dechlorination is proceeding to completion.

**Inorganic Anions.** Within the SWMU 211-B RDSI UCRS wells, chloride and nitrate levels were measured at highest concentration in the deepest well, MW516, and the highest sulfate concentration was measured in the shallower well, MW515.

| | SWMU 211-B RDSI Wells | | South of SWMU 211-B | |
|---|---|---|---|---|
| | **MW515 (shallower UCRS well)** | **MW516 (deepest UCRS well)** | **MW217 max value (distal UCRS well)** | **MW218 max value (proximal UCRS well)** |
| Chloride (mg/L) | 160 | 300 | 160 | 340 |
| Nitrate (mg/L) | < 3 | 3 | < 3 | < 3 |
| Sulfate (mg/L) | 22 | 6.4 | 39 | 40 |

The nitrate and sulfate (electron acceptors) concentrations present are not at levels that would be anticipated to hinder the reductive dechlorination pathway. Additionally, sulfate is not present at an elevated concentration that has the potential to result in sulfide concentrations that are toxic to dechlorinating microorganisms.

**Metals.** Among the UCRS SWMU 211-B RDSI wells, the highest measured levels of metals, with the exception of chromium, were found in samples from the shallower UCRS well, MW515.

| | SWMU 211-B RDSI Wells | | South of SWMU 211-B | |
|---|---|---|---|---|
| | MW515 (shallower UCRS well) | MW516 (deepest UCRS well) | MW217 max value (distal UCRS well) | MW218 max value (proximal UCRS well) |
| Aluminum (mg/L) | 8.49 (“N” qualified) | 0.202 (“N” qualified) | 0.647 | 4.61 (“N” qualified) |
| Chromium (mg/L) | 0.0137 | 0.131 | < 0.01 | < 0.01 |
| Iron (mg/L) | 9.79 | 0.605 | 0.354 | 0.515 |
| Lead (mg/L) | 0.0106 | < 0.0013 | 0.00262 | 0.00241 |
| Manganese | 0.32 (“N” qualified) | 0.108 (“N” qualified) | 1.43 | 0.0356 (“N” qualified) |

**Biological.** *Dhc* was not measured at a concentration greater than the reporting limits of 35 cells/mL for MW515 and 25 cells/mL in MW516. The absence of detectable *Dhc* suggests that reductive dechlorination is not occurring at a high rate under current conditions.

**Table 12. Summary of Groundwater Metals, VOCs, and Dissolved Gases Data for SWMU 211-B**

| Analyte | Date Collected | MW217 | | MW218 | | MW515 | | MW516 | |
|---|---|---|---|---|---|---|---|---|---|
| **Total and Dissolved Metals** | | | | | | | | | |
| Aluminum (mg/L) | 9/5/2012 | 0.647 | | 4.48 | | -- | | -- | |
| | 9/12/2012 | 0.2 | U | 2.46 | | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.202 | N |
| | 10/23/2012 | 0.237 | N | 4.61 | N | 8.49 | N | -- | |
| Aluminum, Dissolved (mg/L) | 9/5/2012 | 0.2 | U | 0.2 | U | -- | | -- | |
| | 9/12/2012 | 0.2 | U | 0.2 | U | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.2 | U |
| | 10/23/2012 | 0.2 | U | 0.2 | U | 0.281 | | -- | |
| Chromium (mg/L) | 9/5/2012 | 0.01 | U | 0.01 | U | -- | | -- | |
| | 9/12/2012 | 0.01 | U | 0.01 | U | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.131 | |
| | 10/23/2012 | 0.01 | U | 0.01 | U | 0.0137 | | -- | |
| Chromium, Dissolved (mg/L) | 9/5/2012 | 0.01 | U | 0.01 | U | -- | | -- | |
| | 9/12/2012 | 0.01 | U | 0.01 | U | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.01 | U |
| | 10/23/2012 | 0.01 | U | 0.01 | U | 0.01 | U | -- | |
| Iron (mg/L) | 9/5/2012 | 0.354 | | 0.437 | | -- | | -- | |
| | 9/12/2012 | 0.1 | U | 0.462 | | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.605 | |
| | 10/23/2012 | 0.153 | | 0.515 | | 9.79 | | -- | |
| Iron, Dissolved (mg/L) | 9/5/2012 | 0.1 | U | 0.1 | U | -- | | -- | |
| | 9/12/2012 | 0.1 | U | 0.1 | U | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.1 | U |
| | 10/23/2012 | 0.1 | U | 0.1 | U | 0.139 | | -- | |
| Lead (mg/L) | 9/5/2012 | 0.00262 | | 0.00241 | | -- | | -- | |
| | 9/12/2012 | 0.0013 | U | 0.00213 | | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.0013 | U |
| | 10/23/2012 | 0.0013 | U | 0.00233 | | 0.0106 | | -- | |
| Lead, Dissolved (mg/L) | 9/5/2012 | 0.0013 | UB | 0.0013 | UB | -- | | -- | |
| | 9/12/2012 | 0.0013 | UB | 0.0013 | UB | -- | | -- | |
| | 10/22/2012 | -- | | -- | | -- | | 0.0013 | U |
| | 10/23/2012 | 0.0013 | U | 0.0013 | U | 0.0013 | U | -- | |

**Table 12. Summary of Groundwater Metals, VOCs, and Dissolved Gases Data for SWMU 211-B (Continued)**

| Analyte | Date Collected | MW217 | MW218 | MW515 | MW516 |
|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | |
| Manganese (mg/L) | 9/5/2012 | 1.43 | 0.0204 | -- | -- |
| | 9/12/2012 | 0.806 | 0.0167 | -- | -- |
| | 10/22/2012 | -- | -- | -- | 0.108 N |
| | 10/23/2012 | 0.826 N | 0.0356 N | 0.32 N | -- |
| Manganese, Dissolved (mg/L) | 9/5/2012 | 0.404 | 0.005 U | -- | -- |
| | 9/12/2012 | 0.605 | 0.005 U | -- | -- |
| | 10/22/2012 | -- | -- | -- | 0.127 X |
| | 10/23/2012 | 0.746 X | 0.00664 X | 0.17 X | -- |
| Trichloroethene (µg/L) | 9/5/2012 | 1 UJY | 72 DJY | -- | -- |
| | 9/12/2012 | 1 U | 87 | -- | -- |
| | 10/22/2012 | -- | -- | -- | 8.9 |
| | 10/23/2012 | 1 U | 120 | 2 U | -- |
| 1,1-Dichloroethene (µg/L) | 9/5/2012 | 5 U | 10 UJ | -- | -- |
| | 9/12/2012 | 5 U | 5 U | -- | -- |
| | 10/22/2012 | -- | -- | -- | 5 U |
| | 10/23/2012 | 5 U | 5 U | 10 U | -- |
| *cis*-1,2-Dichloroethene (µg/L) | 9/5/2012 | 1 U | 2.1 DJ | -- | -- |
| | 9/12/2012 | 1 U | 2.2 | -- | -- |
| | 10/22/2012 | -- | -- | -- | 1 U |
| | 10/23/2012 | 1 U | 2.1 | 2 U | -- |
| *trans*-1,2-Dichloroethene (µg/L) | 9/5/2012 | 1 U | 2 UJ | -- | -- |
| | 9/12/2012 | 1 U | 1 U | -- | -- |
| | 10/22/2012 | -- | -- | -- | 1 U |
| | 10/23/2012 | 1 U | 1 U | 2 U | -- |
| Vinyl chloride (µg/L) | 9/5/2012 | 2 U | 4 UJ | -- | -- |
| | 9/12/2012 | 2 U | 2 U | -- | -- |
| | 10/22/2012 | -- | -- | -- | 2 U |
| | 10/23/2012 | 2 U | 2 U | 4 U | -- |
| **Biological** | | | | | |
| *Dehaloccoides enthenogenes* (cells/mL) | 10/22/2012 | -- | -- | -- | 25 U |
| | 10/23/2012 | -- | -- | 35 U | -- |
| **Dissolved Gases** | | | | | |
| Ethane (µg/L) | 9/5/2012 | 0.11 | 0.18 | -- | -- |
| | 9/18/2012 | 0.024 J | 0.013 J | -- | -- |
| | 10/22/2012 | -- | -- | -- | 0.013 J |
| | 10/23/2012 | 0.015 J | 0.025 U | 25 | -- |
| Ethene (µg/L) | 9/5/2012 | 0.14 | 0.24 | -- | -- |
| | 9/18/2012 | 0.039 | 0.021 J | -- | -- |
| | 10/22/2012 | -- | -- | -- | 0.023 J |
| | 10/23/2012 | 0.0093 J | 0.027 | 7.9 | -- |

**Table 12. Summary of Groundwater Metals, VOCs, and Dissolved Gases Data for SWMU 211-B (Continued)**

| Analyte | Date Collected | MW217 | MW218 | MW515 | MW516 |
|---|---|---|---|---|---|
| **Inorganic Anions** | | | | | |
| Methane (µg/L) | 9/5/2012 | 6.5 | 2.4 | -- | -- |
| | 9/18/2012 | 0.75 | 0.18 | -- | -- |
| | 10/22/2012 | -- | -- | -- | 0.52 |
| | 10/23/2012 | 0.52 | 0.056 J | 35 | -- |
| Chloride (mg/L) | 9/5/2012 | 160 | 340 | -- | -- |
| | 9/12/2012 | 160 | 330 | -- | -- |
| | 10/22/2012 | -- | -- | -- | 300 |
| | 10/23/2012 | 150 | 340 | 160 | -- |
| Nitrate (mg/L) | 9/5/2012 | 3 U | 3 U | -- | -- |
| | 9/12/2012 | 3 U | 3 U | -- | -- |
| | 10/22/2012 | -- | -- | -- | 3 |
| | 10/23/2012 | 3 U | 3 U | 3 U | -- |
| Sulfate (mg/L) | 9/5/2012 | 5.6 | 39 | -- | -- |
| | 9/12/2012 | 4.8 | 39 | -- | -- |
| | 10/22/2012 | -- | -- | -- | 6.4 |
| | 10/23/2012 | 39 | 40 | 22 | -- |

**Notes:**

1. B—Applies when the analyte is found in the associated blank.
2. D—Compounds identified in an analysis at a secondary dilution filter.
3. J—Indicates an estimated value.
4. N—Sample spike recovery not within control limits.
5. U (inorganics and organics)—Analyte result is less than the reporting limit.
6. X—Other specific flags and footnotes may be required to properly define results. For the dissolved manganese analyses, the serial dilution test difference exceeded the quality control limit of 10%.
7. Y—Matrix spike, matrix spike duplicate and/or relative percent difference failed acceptance criteria.
8. "---"—signifies sample was not collected.

## 6.4 SWMU 211-B HU HYDROLOGIC ANALYSIS

Both field and laboratory evaluations were performed to assess the ability of the HU1, HU2, and HU3 formations to accept injectate (Appendix F) and to predict the likely injection pressures and flow rates that may be encountered during field implementation of an injection remedy. Table 13 presents the results of the flexible wall permeameter tests and injection tests. One of the geotechnical laboratory tests estimated hydraulic conductivity by use of a flexible wall permeameter test (ASTM D5084) performed at nine locations:

- 211-B-001 (5-7 ft bgs/364.92-366.92 ft amsl), 211-B-001 (15-17 ft bgs/354.92-356.92 ft amsl), 211-B-001 (32-37 ft bgs/334.92-339.92 ft amsl)

- 211-B-004 (8-10 ft bgs/361.94-363.94 ft amsl), 211-B-004 (18-20 ft bgs/351.94-353.94 ft amsl), 211-B-004 (38-40 ft bgs/331.94-333.,94 ft amsl)

- MW516 (10-12 ft bgs/360.77-362.77 ft amsl), MW516 (25-26 ft bgs/346.77-347.77 ft amsl), MW516 (40-42 ft bgs/330.77-332.77 ft amsl)

The calculated average hydraulic conductivity values ranged from 1.6E-9 cm/s to 3.3E-6 cm/s.

Injection test results provided estimates of the likely injection pressures and flow rates during performance of an injection-based remedy. MWs MW514, MW515, and MW516 were tested at pressures of 25, 50, 75, and 100 psi and the flow rate was recorded. The injection flow rates and pressures were used as inputs for hydraulic conductivity calculation by the Jacob-Lohman Method, provided by the U.S. Geological Survey (USGS 2002). The Jacob-Lohman method calculated hydraulic conductivity values ranged from 8.8E-6 cm/s to 1.3E-4 cm/s. A viable injection pressure was not determined conclusively based on the tests conducted at these locations. The groundwater elevation increased on multiple instances during injection testing; however, the water level elevation decreased significantly after completion of the test and prior to the start of the next test. Based on this observation, it is suspected that the bentonite seal between the nested well screens did not provide an effective seal resulting in a preferential path for pressure stress, artificially increasing groundwater levels during testing. If required, future injection efforts should consider the use of direct push injection, as opposed to nested well injection. Injection by DPT tends to create a better seal with the borehole, decreasing the chance of injection fluid making its way to the ground surface. Using the direct push injection method and the injection test data, a flow rate of approximately 2.4 gpm at a pressure of 50 psi should provide effective distribution of injectate among the HU1, HU2, and HU3 formations at SWMU 211-B.

A laboratory evaluation of soil samples was performed to obtain soil GSD information (see Appendix F). GSD analyses (ASTM D422) were performed at the following locations:

- 211-B-007 (8-12 ft bgs/360.03-364.03 ft amsl), 211-B-007 (27.5-31.5 ft bgs/340.53-344.53 ft amsl), 211-B-007 (42.5-44 ft bgs/328.03-329.53 ft amsl)

- 211-B-004 (5-7.5 ft bgs/364.44-366.94 ft amsl), 211-B-004 (21.1-23.5 ft bgs/348.44-350.84 ft amsl), 211-B-004 (36-38 ft bgs/333.94-335.94 ft amsl)

- 211-B-001 (8-10 ft bgs/361.92-363.92 ft amsl), 211-B-001 (18-20 ft bgs/351.92-353.92 ft amsl), 211-B-001 (38-40 ft bgs/331.92-333.92 ft amsl)

Overall, the GSD results indicate that injection technologies would be expected to be successful (though rate/pressure limited due to grain size) at SWMU 211-B.

**Table 13. Summary of Hydrologic Unit Hydraulic Conductivities for SWMU 211-B**

| Permeameter Test Result Summary | | | |
|---|---|---|---|
| **Boring Location** | **Hydrologic Unit** | **Sample Depth/Elevation Interval (ft bgs/ft amsl)** | **Average Vertical Hydraulic Conductivity (cm/s)** |
| 211-B-001 | HU1 | 5-7/364.92-366.92 | 3.8E-08 |
| 211-B-001 | HU2 | 15-17/354.92-356.92 | 3.3E-06 |
| 211-B-001 | HU3 | 32-37/334.92-339.92 | 1.9E-09 |
| 211-B-004 | HU1 | 8-10/361.94-363.94 | 4.8E-07 |
| 211-B-004 | HU2 | 18-20/351.94-353.94 | 1.6E-09 |
| 211-B-004 | HU3 | 38-40331.94-333.94 | 2.5E-09 |
| MW516 | HU1 | 10-12/360.77-362.77 | 9.2E-07 |
| MW516 | HU2 | 25-26/346,77-347.77 | 4.6E-08 |
| MW516 | HU3 | 40-42/330.77-332,77 | 1.1E-07 |

| Injection Test Result Summary | | | | |
|---|---|---|---|---|
| **Monitoring Well** | **Hydrologic Unit** | **Injection Pressure (psi)** | **Average Flow Rate (gpm)** | **Calculated Horizontal Hydraulic Conductivity (cm/s)** |
| MW514 | HU1 | 25 | 2.3 | 1.3E-04 |
| MW514 | HU1 | 50 | 2.4 | 6.7E-05 |
| MW514 | HU1 | 75 | 3.1 | 4.2E-05 |
| MW514 | HU1 | 100 | 3.4 | 3.3E-05 |
| MW515 | HU2 | 25 | 1.9 | 3.9E-05 |
| MW515 | HU2 | 50 | 2.8 | 1.8E-05 |
| MW515 | HU2 | 75 | 3.7 | 1.2E-05 |
| MW515 | HU2 | 100 | 4.5 | 8.8E-06 |
| MW516 | HU3 | 25 | 1.9 | 4.6E-05 |
| MW516 | HU3 | 50 | 3.1 | 2.4E-05 |
| MW516 | HU3 | 75 | 3.3 | 1.6E-05 |
| MW516 | HU3 | 100 | 4.2 | 1.2E-05 |

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# 7. SWMU 211-A DATA EVALUATION AND ASSESSMENT

Data collected during the RDSI further delineated the magnitude and areal and vertical extents of TCE and other VOC contamination in SWMU 211-A within the Southwest Plume source areas. The results of the RDSI and previous investigations of the SWMU 211-A area indicate that soils containing VOC contamination are located within the subsurface north of the northeast corner of the C-720 Building Area. The highest level of TCE (4,800 μg/kg) detected during the RDSI was at a depth of 47.5 ft bgs/326.97 ft amsl (211-A-036), with low-levels of *cis*-1,2-DCE (77 μg/kg) and 1,1-DCE (3,300 μg/kg) also detected. Sample location 211-A-036 is located approximately 240 ft north by northwest of the previous investigation maximum concentration (8,100 μg/kg TCE at 30 ft depth/344.39 ft amsl elevation in location 720-027 from the WAG 27 RI). RDSI soil locations from this investigation in close proximity to historical soil sample location 720-027 are 211-A-010 and 211-A-017, with 211-A-017 having the greatest TCE concentration of 1,600 μg/kg at 30.1 ft bgs/344.79 ft amsl. Among the Southwest Plume SI borings in the SWMU 211-A area, TCE levels were highest in location 720-105 (980 μg/kg at 46 ft depth/approximately 328.2 ft amsl) (DOE 2007). Overall results from the soil samples indicate that dehalogenation (i.e., degradation of parent VOCs to daughter products such as TCE degrading to *cis*-1,2-DCE and VC) is occurring. Of the 542 soil samples collected for VOC analysis during the RDSI, 316 samples have a TCE detection, 196 samples have a 1,1-DCE detection, 189 samples have a *cis*-1,2-DCE detection, no samples have a *trans*-1,2-DCE detection, and 23 samples have a VC detection. Groundwater analysis results also support that TCE degradation is occurring.

Results of the UCD soil samples from the RDSI and historical data were used to create a three-dimensional contamination model using the software Environmental Visualization Systems Expert System (EVS-ES). A five-layer geologic model was used for modeling soil contamination. Analytical results from this investigation and all historical soil TCE data for the SWMU 211-A investigation area in the OREIS, shown in Figure 6, were log processed in the model. The Horizontal/Vertical Anisotropy Ratio parameter, which allows the model to take into consideration expected differences in fluid flow through the soil matrix, was set to a value of 1.5. The Octant Search method was used to determine which sample points are selected for inclusion in the kriging matrix. This method sets a maximum number of points for each octant, which helps offset bias effects of sampling distribution irregularities. The model used a soil density of 1.4 g/cc and a chemical density of 1.46 g/cc. The SWMU 211-A soil impacted greater than 75 µg/kg of TCE based upon a 90% confidence level that is estimated to have an areal extent of 34,000 $ft^2$. The mass of TCE in the SWMU 211-A soil impacted greater than 75 μg/kg is estimated to be 2.2 gal (12 kg). Figure 6 also shows the smaller areas of 75 µg/kg soil TCE (50% confidence limit) and 1,000 µg/kg soil TCE (90% confidence limit) for comparison. These extents define distinct east and west areas of TCE contamination.

Figure 9[7] shows a cross-section through the locations of the greatest magnitude concentrations. The TCE isopleths depicted in Figure 9 show a predominance of TCE impacts in the western portion of the cross-section in the 25 to 50 ft bgs depth interval. A sensitivity analysis was performed. The sensitivity analysis utilized a range of values to evaluate the area of VOC impacts and volume present. The volume/mass estimates range from 0.2 gal/1 kg to 2.2 gal/12 kg for a range of 10% to 90% confidence level with a volume/mass of 0.7 gal/4 kg for the 50% confidence level. A CD containing viewable three-dimensional model EVS-ES files and supporting calculations and technical details are included in Appendices B and C.

---

[7] Figure 9 is a cross section taken from a three-dimensional model of TCE sample results. Where samples were not collected for laboratory analyses from the bottom depth of a soil boring (samples were collected at discrete intervals targeted by field measurements over each 5-ft interval), the bottom depths depicted on Figure 9 do not represent the total depth of the soil boring.

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| 211-A-036 & 211-A-036a | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 10/3/2012 | 0.1 | 0.41 U | 1.7 U |
| | 9 | 0.47 U | 1.9 U |
| | 14.7 | 0.42 U | 1.7 U |
| | 19 | 0.67 J | 2.1 J |
| | 22 | **280 J** | 31 U |
| | 26.5 | **810** | **340** |
| | 31.5 | **1,400** | **1,600** |
| | 35.5 | **2,800** | **3,700** |
| | 44.5 | **3,800** | **3,900** |
| | 47.5 | **4,800** | **3,300** |
| | 50.1 | **1,300** | **690** |
| | 55.5 | 3 J | 1.5 U |
| | 61 | 33 | 12 |
| | Average | **1,171** | **1,043** |

| 211-A-028 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/24/2012 | 4 | 0.38 U | 1.6 U |
| | 9 | 0.43 U | 1.8 U |
| | 14 | 0.41 U | 1.7 U |
| | 19 | 0.76 J | 55 |
| | 22.5 | 0.44 U | 1.8 J |
| | 26 | **210** | **290** |
| | 34 | **220 J** | 55 J |
| | 38.5 | **3,700** | **4,200** |
| | 42.5 | **2,800** | **3,800** |
| | 48 | **1,600** | **1,800** |
| | 50.5 | **1,700** | **1,400** |
| | 55.1 | 42 | 79 |
| | 61 | **180** | 66 |
| | Average | **804** | **904** |

| 211-A-029 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/25/2012 | 4 | 0.4 U | 1.7 U |
| | 9 | 0.51 U | 2.1 U |
| | 14 | 0.4 U | 1.7 U |
| | 18 | 0.31 U | 1.3 U |
| | 24.9 | 23 | 18 |
| | 28.5 | **440** | **240** |
| | (32)DUP | **110** | 77 |
| | 32 | **480** | **360** |
| | 38 | **2,600** | **2,900** |
| | 40.5 | **870** | **880** |
| | 48.5 | **270** | **350** |
| | 50.5 | 22 | 27 |
| | 55.1 | 3.8 J | 4.4 J |
| | 64 | **100** | 15 |
| | Average | **351** | **348** |

| 211-A-014 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/5/2012 | 4 | 0.39 U | 1.6 U |
| | 9 | 0.4 U | 24 |
| | 14 | 0.41 U | 6.1 J |
| | 19 | 0.33 U | 1.4 U |
| | 24.5 | 0.34 U | 1.4 U |
| | 29.5 | 0.31 U | 1.7 J |
| | 34.5 | 18 | 22 |
| | (36.5)DUP | 28 | 43 |
| | 36.5 | 0.35 U | 1.5 U |
| | 42 | 59 | **140** |
| | 45.1 | 24 | 57 |
| | 50.5 | 26 | 34 |
| | 56 | 2.4 J | 1.4 U |
| | 63.5 | 16 | 7.6 J |
| | Average | 12 | 24 |

| 211-A-015 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/6/2012 | 4.5 | 0.41 U | 1.7 U |
| | 6 | 0.41 U | 1.7 U |
| | 14 | 0.38 U | 1.6 U |
| | 19 | 0.37 U | 1.5 U |
| | 24 | 0.31 U | 1.3 U |
| | 25.5 | 0.35 U | 1.4 U |
| | 34 | 20 | 30 |
| | 39 | 51 | 83 |
| | 44.9 | 47 | 22 |
| | 46.5 | **120** | 24 |
| | 50.1 | **130** | 5.9 J |
| | 59.9 | 57 | 47 |
| | 63 | 36 | 25 |
| | Average | 36 | 19 |

| 211-A-022 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/27/2012 | 0.5 | 0.43 U | 1.8 U |
| | 6 | 2.7 J | 1.7 U |
| | 14 | 3.2 J | 1.6 U |
| | 18.5 | 1.6 J | 1.5 U |
| | 24.9 | 0.37 U | 1.5 U |
| | 27.5 | 0.36 U | 1.5 U |
| | 33.5 | 0.36 U | 1.5 U |
| | 35.1 | 8.5 J | 6.7 J |
| | 44 | 10 | 12 |
| | 49.5 | 6.7 J | 5 J |
| | 54.5 | 13 | 17 |
| | 56 | **88** | 1.8 J |
| | 62 | 27 | 5.3 J |
| | Average | 12 | 4 |

| 211-A-020 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/24/2012 | 4.5 | 0.43 U | 1.8 U |
| | 9 | 9.9 J | 1.7 U |
| | (9)DUP | 6.7 J | 1.6 U |
| | 11 | 3.9 J | 1.8 U |
| | 19 | 23 | 1.5 U |
| | 20.1 | 12 | 1.9 U |
| | 25.9 | **710** | 24 U |
| | 32 | **210** | 1.9 U |
| | 35.5 | **470** | 25 U |
| | 40.1 | **770** | 23 U |
| | 48 | **800** | 23 U |
| | 53.5 | **300** | 22 U |
| | 57 | **800** | 25 U |
| | 62 | **180** | 6.7 J |
| | 65.1 | **160** | 17 |
| | Average | **297** | 7 |

| 211-A-023 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/11/2012 | 1 | 0.4 U | 1.7 U |
| | 7 | 0.37 U | 1.5 U |
| | 14.9 | 0.36 U | 1.5 U |
| | 18 | 0.36 U | 1.5 U |
| | 20.1 | 0.33 U | 1.6 J |
| | (20.1)DUP | 0.36 U | 7.2 J |
| | 25.5 | 0.33 U | 3.9 J |
| | 34.9 | 0.37 U | 1.5 U |
| | 36.5 | 0.43 U | 1.8 U |
| | 43 | 0.39 U | 7.9 J |
| | 49 | 1.4 J | 9.9 |
| | 53 | 66 | 8.6 J |
| | 55.1 | **130** | 6.9 J |
| | 62 | 73 | 11 |
| | Average | 19 | 4 |

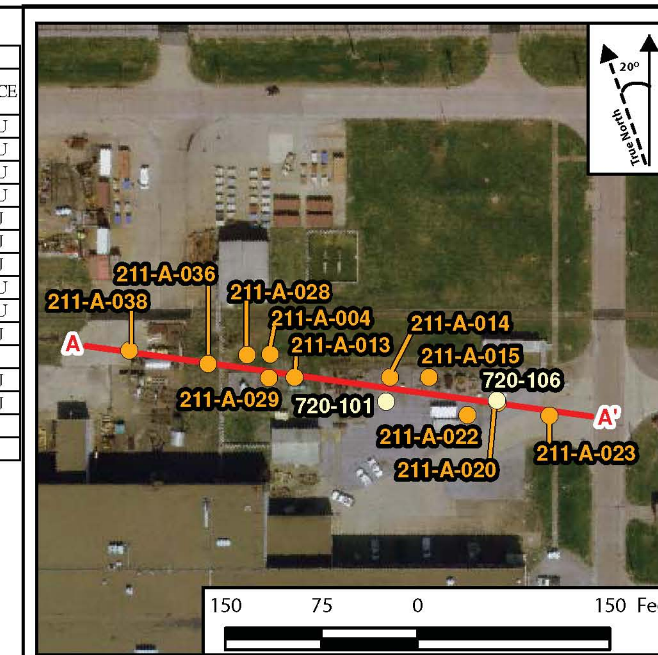
| 211-A-038 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 2/25/2013 | 3 | 0.37 U | 1.5 U |
| | 7.5 | 20 U | 27 U |
| | 12 | 23 U | 32 U |
| | 15.5 | 0.41 U | 1.7 U |
| | 20.5 | 26 | 1.6 U |
| | 28.5 | 0.36 U | 1.5 U |
| | 32.5 | 0.37 U | 1.5 U |
| | 39 | 30 | 1.6 U |
| | 43 | 61 | 2 J |
| | 49.9 | 0.98 J | 1.6 U |
| | 54.5 | 6.6 J | 1.5 U |
| | 56 | 20 | 3.6 J |
| | 62 | 11 | 1.8 J |
| | Average | 14 | 3.3 |

| 211-A-004 | | | |
|---|---|---|---|
| Sample | Sample | TCE | 1,1 DCE |
| 8/31/2012 | 4 | 0.39 U | 1.6 U |
| | 9 | 0.38 U | 1.6 U |
| | 14 | 0.36 U | 1.6 J |
| | 16.5 | 0.33 U | 18 |
| | 24.9 | **1,700** | **1,600** |
| | 27 | **960** | **970** |
| | 30.1 | **620** | **900** |
| | 35.1 | **1,200** | **1,400** |
| | 40.1 | **2,400** | **4,400** |
| 9/4/2012 | 48.5 | 17 U | **480** |
| | 53.5 | 33 J | 110 J |
| | 59.9 | **97** | 12 |
| | 61 | **160** | 23 |
| | Average | **552** | **763** |

| 211-A-013 | | | |
|---|---|---|---|
| Sample Date | Sample Depth | TCE | 1,1 DCE |
| 9/4/2012 | 4.9 | 0.34 U | 1.4 U |
| | 6.5 | 5.7 J | 1.6 U |
| | 14 | 42 | 1.6 U |
| | 18.5 | 0.37 U | 1.5 U |
| | 20.5 | 9.3 | 1.4 U |
| | 26.5 | 3.3 J | 1.4 U |
| | 30.1 | 22 | 7.8 J |
| | 35.5 | 29 | 5.1 J |
| | 44.5 | **170 J** | **350** |
| 9/5/2012 | 47.5 | **78 J** | 180 J |
| | 53.5 | 13 | 11 |
| | 55.1 | 13 | 12 |
| | 64 | 56 | 13 |
| | Average | 34 | 45 |

| 720-101 | |
|---|---|
| Jun-04 | |
| Sample Depth | TCE |
| 15.5/18.5 | ND |
| 30.5 | 69 |
| 45.5 | 60 |
| 56.0 | 54 |

| 720-106 | |
|---|---|
| Jun-04 | |
| Sample Depth | TCE |
| 15.5 | 30 |
| 30.0 | **180** |
| 46.0 | **590** |
| 56.5 | **440** |



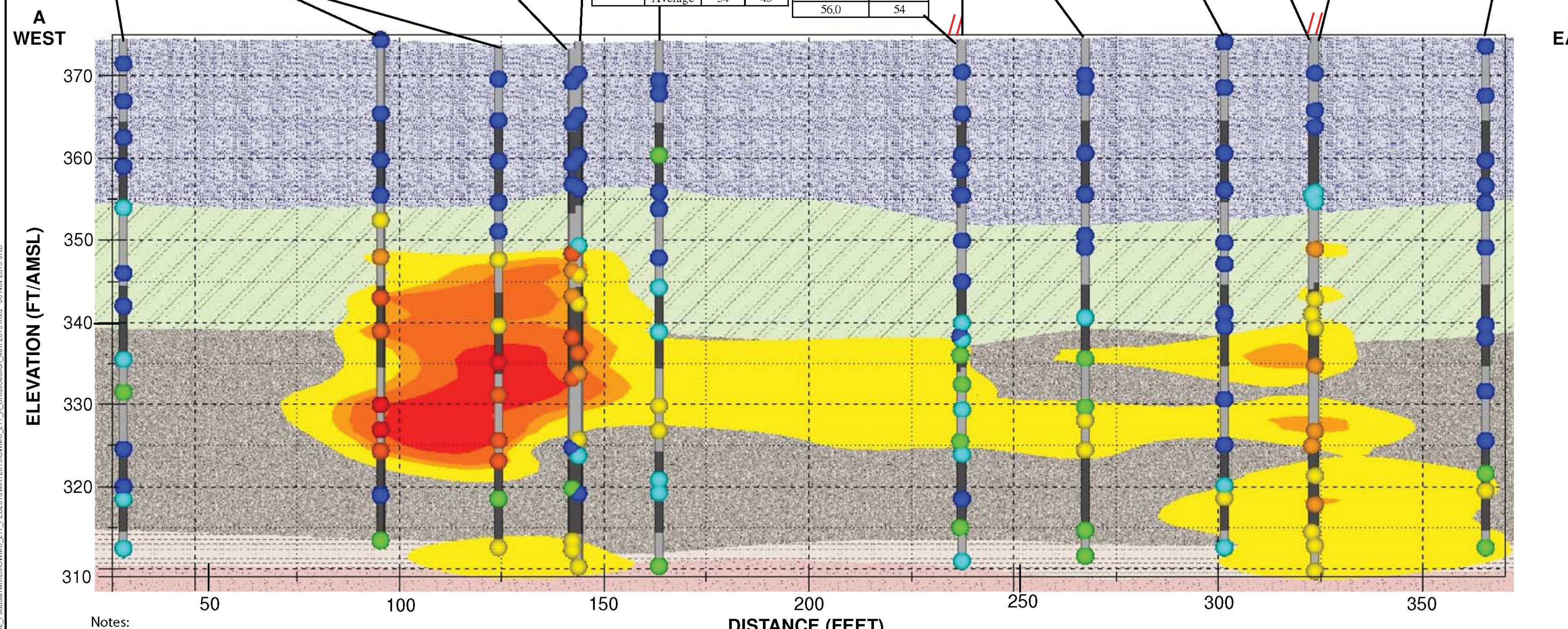

Legend

Historic Soil Sample Location

Soil Sample Locations

A-A' Transect

Note:
Source of 2009 Aerial:
Williams Aerial & Mapping, Inc.




**Legend**

**Hydrogeologic unit**

HU1 Upper Silt Interval (UCRS)

HU2 Sand with Gravel Lenses (UCRS)

HU3 Silt and Clay Silt (UCRS)

HU4 Medium to Coarse Sand (RGA)

HU5 Medium to Coarse Sand and Gravel (RGA)

**TCE Concentration**

3,000 - 5,000 µg/kg

1,000 - 3,000 µg/kg

500 - 1,000 µg/kg

75 - 500 µg/kg

30 - 75 µg/kg

10 - 30 µg/kg

1 - 10 µg/kg

| Groundwater Protection Remediation Goals | | |
|---|---|---|
| Parameter | Abbreviation | UCRS Soil Cleanup Level (µg/kg) |
| Trichloroethene | TCE | 75 |
| 1,1-Dichloroethene | 1,1 DCE | 137 |

Notes:
1. // indicates location of overlapping soil borings. TCE concentrations for both locations appear graphically superimposed on the soil boring and are reported in the tables above.
2. Soil samples collected from 4 October 2012 to 6 March 2013.
3. Results are presented in microgram per kilogram (µg/kg).
4. FT AMSL indicates feet above mean sea level.
5. DUP indicates duplicate sample.
6. J indicates an estimated value.
7. U indicates compound analyzed for but not detected at or below the lowest concentration reported.
7. Yellow shaded, bold text indicates an exceedance of the Soil Protection Remediation Goal for Volatile Organic Compounds.
8. Trichloroethene (TCE) isopleths are based upon depth discrete individual results, not average borehole soil concentrations.
9. C Tech's Environmental Visualization Systems Expert System used to develop TCE isopleths.
10. Select soil borings were used to determine the hydrologic units.
11. Soil borings within 15 feet of transect are projected onto it.
12. TCE concentrations projected onto the cross section were derived from the EVS-ES nominal (50%) confidence level.

**SWMU 211-A Cross-Section with TCE Isopleths and Hydrogeologic Units**

Paducah Gaseous Diffusion Plant
Kevil, Kentucky

Geosyntec consultants

Figure 9

Titusville, FL | May 2013

Path: (Titusville-01\Data)T\GIS\FR5082_Paducah\MXDs\SWMU_211_FEB2013\MAY2013\SWMU_211_A_CrossSection_MAY2013.mxd 06 Nov 2013 JRB

**Figure 9. SWMU 211-A Cross-Section with TCE Isopleths and Hydrologic Units**

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There are two areas with soil remediation goal exceedances that are defined by the areal distribution of soil boring locations with depth-average TCE concentration greater than 75 µg/kg. Although there are 1,1-DCE exceedances, their location is less extensive and coincides with TCE exceedances. The western area (defined by borings 211-A-004, 211-A-005, 211-A-028, 211-A-029, 211-A-033, 211-A-035, and 211-A-036) covers approximately 15,900 $ft^2$ (based upon 50% nominal 75 µg/kg isocontour) laterally with a depth interval of 6 ft bgs to 64 ft bgs. The eastern area (defined by borings 211-A-002, 211-A-010, 211-A-017, 211-A-020, and 211-A-025) covers approximately 15,000 $ft^2$ (based upon 50% nominal 75 µg/kg isocontour) laterally with a depth interval from 6.5 ft bgs to 65.1 ft bgs.

Overall, FCR findings tend to be consistent with the current CSM regarding the depth and magnitude of VOC soil contamination; however, the horizontal location of the greatest TCE soil impact (potential source area) does not align with previous SI findings. The current CSM assumes the TCE source area is located near soil sample location 720-027 (DOE 1999) (see Figure 4). During performance of the RDSI, the greatest magnitude TCE concentration was located at soil sample location 211-A-036, which indicates that an additional TCE source also is located west of soil sample location 720-027. A number of depth-averaged TCE concentration soil boring locations lower than 75 µg/kg were installed between historical location 720-027 and 211-A-036 indicating separate source areas. The information presented in this FCR indicates that the area of TCE source-based mass for the 211-A site is larger than previously assumed.

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# 8. SWMU 211-B DATA EVALUATION AND ASSESSMENT

RDSI results and those of previous investigations of the SWMU 211-B area indicate that soils containing low-levels of VOC contamination are present in the subsurface at the southeast corner of the C-720 Building Area (Figure 8). The greatest TCE soil concentration (13,000 μg/kg) detected during this investigation was at 25.1 ft bgs/346.90 ft amsl (211-B-019), which is approximately 10 ft west of the previous investigation maximum concentration (68,000 μg/kg) location (720-002 at 20 ft depth/351.80 ft amsl). Another soil location from this investigation in close proximity to 720-002 is 211-B-005, with a maximum TCE concentration of 3,100 μg/kg at a depth of 23 ft bgs/348.94 ft amsl. Overall results from the soil samples indicate that dehalogenation likely is occurring at SWMU 211-B. Of the 245 soil samples collected for VOC analysis during the RDSI, 171 samples have a TCE detection and 27 samples have a *cis*-1,2-DCE detection. Groundwater analysis results also support this finding. The TCE soil isopleths depicted in Figure 10[8] show that the mass present is predominantly located in HU2, with limited low-level detections below HU3 (near the RGA).

Overall, RDSI VOC results at SWMU 211-B trend to be consistent with the previous CSM. The lateral location, vertical location, and magnitude of the greatest magnitude TCE impacts align with previous SI findings. Data available at SWMU 211-B are sufficient to provide a foundation for selection of an appropriate remedial technology to address VOC-impacted groundwater.

As at SWMU 211-A, results of the UCD soil samples from this investigation and historical data were used to create a three dimensional model (using EVS-ES) to represent SWMU 211-B soil impacts. A five-layer geologic model was used for modeling soil contamination. Soil analytical results from this investigation, shown in Figure 8, were log-processed in the model. As at SWMU 211-A, the Horizontal/Vertical Anisotropy Ratio parameter was set to 1.5. The Octant Search method was used to determine which sample points are selected for inclusion in the kriging matrix. The model used a soil density of 1.4 g/cc and a chemical density of 1.46 g/cc. The SWMU 211-B soil impacted greater than 75 μg/kg of TCE is estimated to be 3,213 bank cubic yards (bcy). The mass of TCE in the SWMU 211-B soil impacted greater than 75 μg/kg is estimated to be 5 kg (0.8 gal) at a 90% confidence level. The mass and volume estimates do not extrapolate the area beneath the C-720 Building. Additional TCE impacts mass may be present beneath the C-720 building, but the purpose of this FCR is to select a remedy for accessible soil contamination. Figure 8 also shows the smaller areas of 75 μg/kg soil TCE (50% confidence limit) and 1,000 μg/kg soil TCE (90% confidence limit) for comparison. A sensitivity analysis was performed. The volume/mass estimates range from 0.1 gal/0.6 kg to 0.8 gal/4 kg for a range of 10% to 90% confidence level with a volume/mass of 0.3 gal/2 kg for the 50% confidence level. A CD containing viewable three-dimensional model EVS-ES files and details regarding the sensitivity analysis are included in Appendices B and C.

The area potentially requiring treatment is defined by the areal distribution of soil boring locations with depth-average TCE concentration greater than 75 μg/kg. The area (defined by borings 211-B-001, 211-B-004, 211-B-005, and 211-B-019) covers approximately 3,000 $ft^2$ (at a 90% source volume confidence level) laterally with a depth interval of 8.5 ft bgs to 64.5 ft bgs (approximate volume of 6,200 bcy).

---

[8] Figure 10 is a cross section taken from a three-dimensional model of TCE sample results. Where samples were not collected for laboratory analyses from the bottom depth of a soil boring (samples were collected at discrete intervals targeted by field measurements over each 5-ft interval), the bottom depths depicted on Figure 10 do not represent the total depth of the soil boring.

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| 211-B-001 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/9/2012 | 4.9 | 27 |
| | 8.5 | **78** |
| | 10.5 | **150** |
| | (10.5)DUP | **100** |
| | 19.5 | **91** |
| | 23 | **1,700** |
| | 25.1 | 19 |
| | 34 | 15 |
| | 39.5 | **93** |
| | 44 | **310** |
| | 49.5 | 61 |
| | 53 | **84** |
| | 55.5 | 24 |
| | 60.5 | 1.2 J |
| | Average | **197** |

| 211-B-002 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/10/2012 | 3 | 0.41 U |
| | 9 | 0.36 U |
| | 14 | 0.35 U |
| | 18.5 | 2.2 J |
| | 21 | **170 J** |
| | 29 | 1.8 J |
| | 31.5 | 52 |
| | 35.5 | **210** |
| | 44.5 | **93** |
| | 47.5 | 23 |
| | 50.5 | 0.39 U |
| | 59.5 | 4.1 J |
| | 62.5 | 1.8 J |
| | Average | 43 |

| 211-B-003 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/10/2012 | 4 | 0.41 U |
| | 9 | 0.41 U |
| | 14.5 | 1 J |
| | 19.5 | 0.46 J |
| | (19.5)DUP | 0.5 J |
| | 23 | 0.35 U |
| | 28.5 | 0.33 U |
| | 34 | 0.87 J |
| | 39 | 17 |
| | 40.5 | 19 |
| | 49.5 | 17 |
| | 52 | 61 |
| | 58.5 | 9 J |
| | Average | 10 |

| 211-B-015 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/16/2012 | 3 | 1.6 J |
| | 5.1 | 2.2 J |
| | 13.5 | 4.9 J |
| | 19.9 | 1 J |
| | 21.5 | **170** |
| | 29.5 | **120** |
| | 30.5 | 5.4 J |
| | 37 | 5.5 J |
| | 41.5 | 37 |
| | 48.5 | 17 |
| | 52 | 39 |
| | 56 | 42 |
| | 60.5 | 67 |
| | Average | 39 |

| 211-B-004 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/11/2012 | 3.5 | 12 |
| | 7 | 30 |
| | 14.5 | **1,800** |
| | 17.5 | 72 |
| | 20.1 | **380** |
| | 25.5 | **920** |
| | 30.1 | **900** |
| | 35.1 | **250** |
| | 41 | **620** |
| | 49.9 | **270** |
| | 51 | 19 U |
| | 55.1 | 75 |
| | 62 | **100 J** |
| | Average | **418** |

| 211-B-005 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/15/2012 | 4.9 | 46 |
| | 5.1 | 71 |
| | 13.5 | **340** |
| | 18 | **130** |
| | 23 | **3,100** |
| | (29.5)DUP | **2,900** |
| | 29.5 | **700** |
| | 30.5 | **1,400** |
| | 35.5 | **380** |
| | 40.5 | **1,500** |
| | 48 | **690** |
| | 50.5 | **360** |
| | 59 | **340** |
| | 60.1 | **120 J** |
| | Average | **863** |

| 211-B-019 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/18/2012 | 2.5 | 10 |
| | (2.5)DUP | 6.7 J |
| | 9.5 | 28 |
| | 12 | **110** |
| | 19.5 | 3.2 J |
| | 23 | **2,700** |
| | 25.1 | **13,000** |
| | 32 | **170** |
| | 37 | **100** |
| | 40.5 | **170** |
| | 45.1 | **130** |
| | 54 | 44 |
| | 58 | 22 |
| | 64.5 | 0.46 U |
| | Average | **1,178** |

| 211-B-006 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/15/2012 | 4.5 | 0.41 U |
| | 9 | 0.41 U |
| | 13.5 | 4.7 J |
| | 17.5 | 29 |
| | 21 | **92** |
| | 29.5 | 25 |
| | 31 | 3.3 J |
| | 37.5 | 4 J |
| | 44.9 | 14 |
| | 49.5 | 11 |
| | 52.5 | 7.6 J |
| | 59 | 1.2 J |
| | 62 | 0.47 U |
| | Average | 15 |

| 211-B-007 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/16/2012 | 2.5 | 0.35 U |
| | 5.5 | 0.32 U |
| | 11 | 0.39 U |
| | 17.5 | 0.4 U |
| | 23 | 0.98 J |
| | (23)DUP | 0.73 J |
| | 25.1 | 0.51 J |
| | 33.5 | 15 |
| | 35.5 | 7.4 J |
| | 44.5 | 9.7 J |
| | 49 | 0.35 U |
| | 53.5 | 7.3 J |
| | 55.1 | 6.3 J |
| | 60.1 | 5.1 J |
| | Average | 4 |

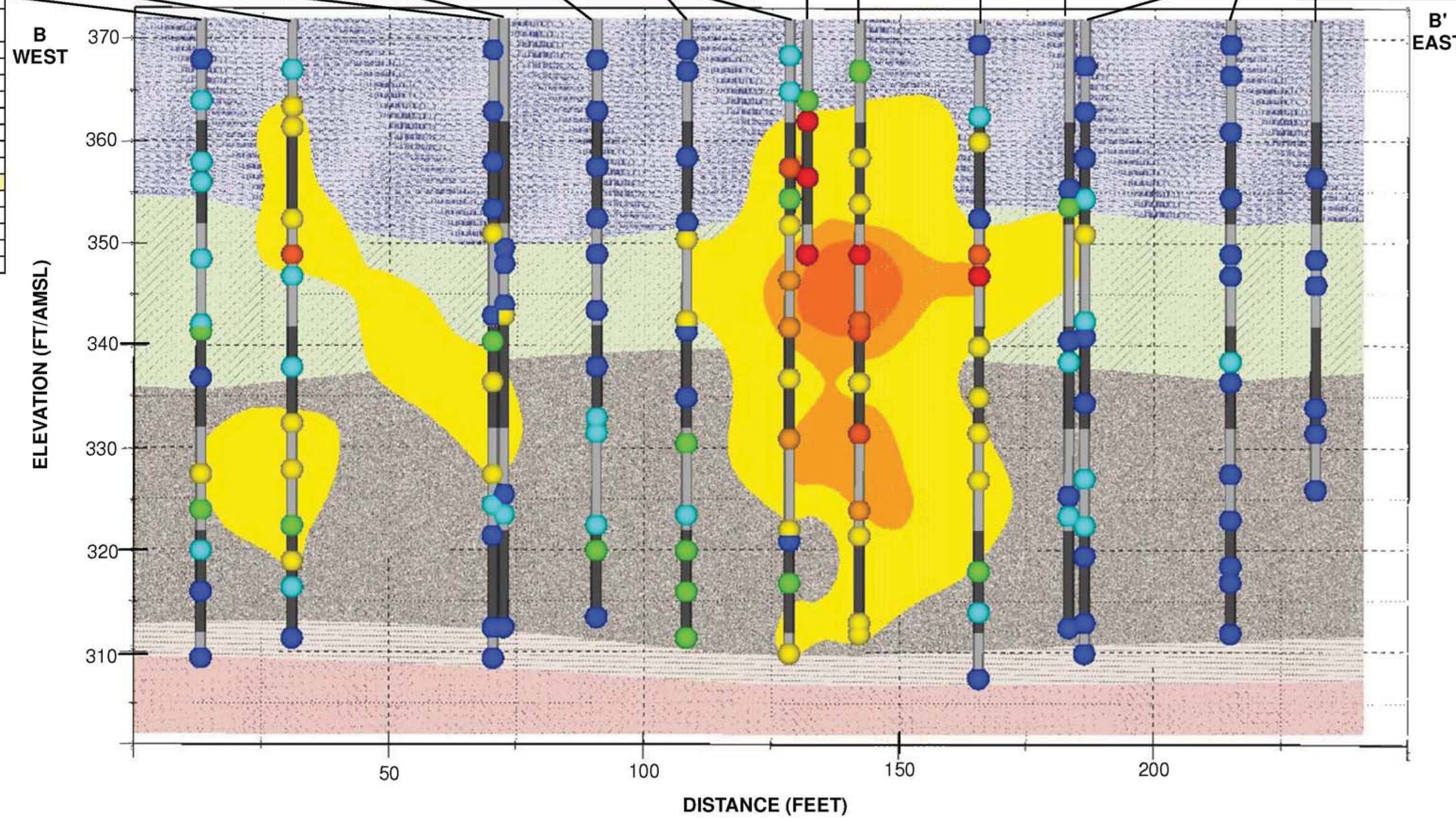
| 720-107 | |
|---|---|
| Jun-04 | |
| Sample Depth | TCE |
| 20.5 | ND |
| 26.0/27.0 | **200** |
| 45.5 | 20 |
| 56.5/58.5 | ND |

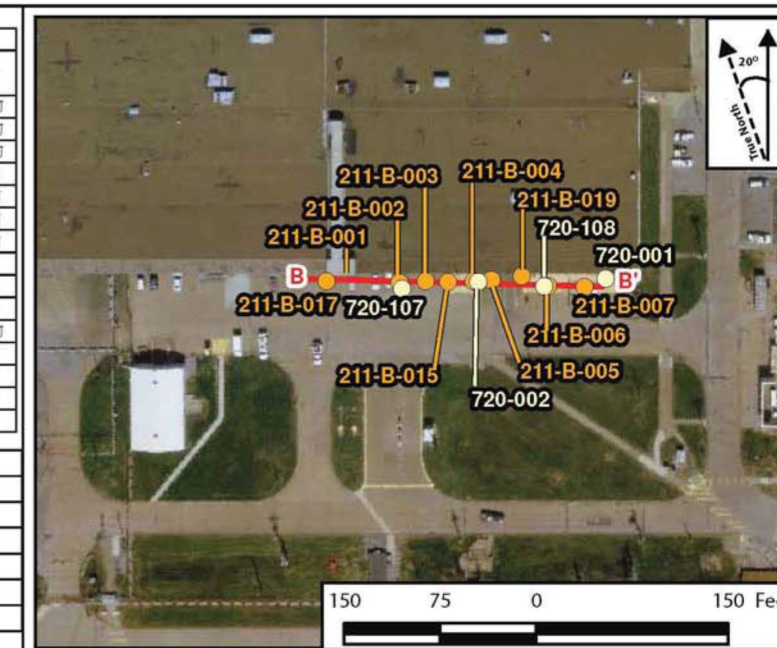
| 720-002 | |
|---|---|
| Mar-98 | |
| | TCE |
| 8 | 37 |
| 10 | **17,000** |
| 16 | **19,000** |
| 21 | **68,000** |
| 26 | **32,000** |

| 720-108 | |
|---|---|
| Jun-04 | |
| Sample Depth | TCE |
| 15.3 | 46 |
| 30.3 | 16 |
| 45.6 | 13 |
| 56.5/58.5 | ND |

| 720-001 | |
|---|---|
| Mar-98 | |
| Sample Depth | TCE |
| 15.5 | ND |
| 26 | ND |
| 38 | ND |
| 46 | ND |

| 211-B-017 | | |
|---|---|---|
| Sample Date | Sample Depth | TCE |
| 10/17/2012 | 4 | 6.1 J |
| | 8 | 26 |
| | 14 | 28 |
| | 16 | 13 |
| | 23.5 | 13 |
| | 29.9 | 16 |
| | 30.5 | 39 |
| | 35.1 | 8.9 J |
| | 44.5 | **120** |
| | 48 | 37 |
| | 52 | 20 |
| | 56 | 3.4 J |
| | 62.5 | 0.38 U |
| | Average | 25 |




**Legend**

- Historic Soil Sample Location
- Soil Sample Locations
- B-B' Transect

Note:
Source of 2009 Aerial: Williams Aerial & Mapping, Inc.

**Legend**

**Hydrogeologic unit**

- HU1 Upper Silt Interval (UCRS)
- HU2 Sand with Gravel Lenses (UCRS)
- HU3 Silt and Clay Silt (UCRS)
- HU4 Medium to Coarse Sand (RGA)
- HU5 Medium to Coarse Sand and Gravel (RGA)

**TCE Concentration**

- 3,000 - 5,000 µg/kg
- 1,000 - 3,000 µg/kg
- 500 - 1,000 µg/kg
- 75 - 500 µg/kg
- 30 - 75 µg/kg
- 10 - 30 µg/kg
- 1 - 10 µg/kg

| Groundwater Protection Remediation Goals | | |
|---|---|---|
| Parameter | Abbreviation | UCRS Soil Cleanup Level (µg/kg) |
| Trichloroethene | TCE | 75 |

Notes:
1. Soil samples collected from 4 October 2012 to 19 October 2012.
2. Results are presented in microgram per kilogram (µg/kg).
3. FT AMSL indicates feet above mean sea level.
4. DUP indicates duplicate sample.
5. J indicates an estimated value.
6. U or ND indicates compound analyzed for but not detected at or below the lowest concentration reported.
7. Yellow shaded, bold text indicates an exceedance of the Soil Protection Remediation Goal for Trichloroethene (TCE) of 75 µg/kg.
8. TCE isopleths are based upon depth discrete individual results, not average borehole soil concentrations.
9. C Tech's Environmental Visualization Systems Expert System used to develop TCE isopleths.
10. Select soil borings were used to determine the hydrologic units.
11. Soil borings within 15 feet of transect are projected onto it.
12. TCE concentrations projected onto the cross section were derived from the EVS-ES nominal (50%) confidence level.

**SWMU 211-B Cross-Section with TCE Isopleths and Hydrogeologic Units**

Paducah Gaseous Diffusion Plant
Kevil, Kentucky

Geosyntec consultants

Figure 10

Titusville, FL | May 2013

Path: (Titusville-01\Data\TTG\GIS\FR5082_Paducah\MXDs\SWMU_211_FEB2013\MAY2013\SWMU_211_B_CrossSection_MAY2013.mxd 10 May 2013 JRB

Figure 10. SWMU 211-B Cross-Section with TCE Isopleths and Hydrologic Units

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As similarly stated in the SWMU 211-A section, RDSI data indicate that soil VOC concentrations are decreasing over time, based on natural processes.

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# 9. CONCLUSION

This FCR presents the results of the RDSI for SWMUs 211-A and 211-B, which were outlined in the *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, 211-B, Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2012a). The RDSI was performed to better determine the lateral and vertical extent and distribution of VOCs and source material in the Southwest Plume source areas and to determine soil and groundwater parameters, including geochemical parameters, at each of the SWMUs to be used to design *in situ* bioremediation, if this alternative is selected. The results of this RDSI provide the data necessary for identifying the areas to be treated and selecting the remedies at SWMUs 211-A and 211-B.

The selected remedy, as identified in the ROD for SWMUs 211-A and 211-B pending this final characterization of source extent and magnitude, is *in situ* source treatment using enhanced *in situ* bioremediation with LUCs (Alternative 8) or long-term monitoring with interim LUCs (Alternative 2).

**SWMU 211-A.** Data collected during the RDSI further delineated the magnitude and areal and vertical extents of TCE and other VOC contamination at SWMU 211-A. As during previous investigations, RDSI results indicate that soils containing VOC contaminations are located at the northeast corner of the C-720 Building Area. However, the highest level of TCE (4,800 µg/kg) detected during the RDSI was at sample location 211-A-036, which is located approximately 240 ft west of the previous investigation maximum concentration (8,100 µg/kg TCE) location (720-027 at 30-ft depth/344.39 ft amsl elevation). The SWMU 211-A soil volume impacted greater than the remediation goal of 75 µg/kg of TCE is estimated to be 29,000 bcy with an areal extent of 34,000 $ft^2$ (using both the RDSI data and all historical soil TCE data for the SWMU 211-A investigation area in OREIS). Approximately 2.2 gal (12 kg) of TCE at a 90% confidence level is estimated to be present.

As part of the hydrologic analysis to assess the ability of the HU1, HU2, and HU3 formations to accept injectate at suitable pressures and flow rates, soil conditions at SWMU 211-A appear to be consistent with the requirements associated with an injection-dependent technology.

Overall results from the RDSI indicate that limited dehalogenation (i.e., degradation of parent VOCs to daughter products such as TCE degrading to *cis*-1,2-DCE and VC and 1,1,1-TCA to 1,1-DCE) is occurring at SWMU 211-A.

**SWMU 211-B.** The lateral location, vertical location, and magnitude of the greatest magnitude TCE impacts align with the current CSM. RDSI results at SWMU 211-B indicate that soils containing VOC contamination are present in the subsurface at the southeast corner of the C-720 Building Area. VOC concentrations are decreasing over time. RDSI soil data indicate that dehalogenation likely is occurring, but is inhibited at SWMU 211-B. The SWMU 211-B soil impacted greater than the remediation goal of 75 µg/kg of TCE is estimated to be 3,213 bcy (using both RDSI data and all historical soil TCE data for the SWMU 211-B investigation area in OREIS). The mass of TCE in the SWMU 211-B soil impacted at TCE concentrations greater than 75 µg/kg and accessible for possible treatment is estimated to be 5 kg (0.8 gal) at a 90% confidence level. Any TCE contamination located underneath the C-720 Building footprint associated with SWMU 211-B will be addressed, as appropriate, under the Soils and Slabs OU, as specified in the Fiscal Year 2013 Site Management Plan (DOE 2013).

The hydrologic analysis to assess the ability of the HU1, HU2, and HU3 formations to accept injectate at suitable pressures and flow rates indicates that soil conditions at SWMU 211-B are consistent with the requirements associated with an injection dependent technology: a flow rate of approximately 2.4 gpm at a pressure of 50 psi, if achievable, should provide effective distribution of injectate among the HU1, HU2, and HU3 formations at SWMU 211-B. Overall results from the RDSI indicate that limited dehalogenation (i.e., degradation of parent VOCs to daughter products such as TCE degrading to *cis*-1,2-DCE) is occurring at SWMU 211-B.

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# APPENDIX A

# MONITORING WELL CONSTRUCTION LOGS

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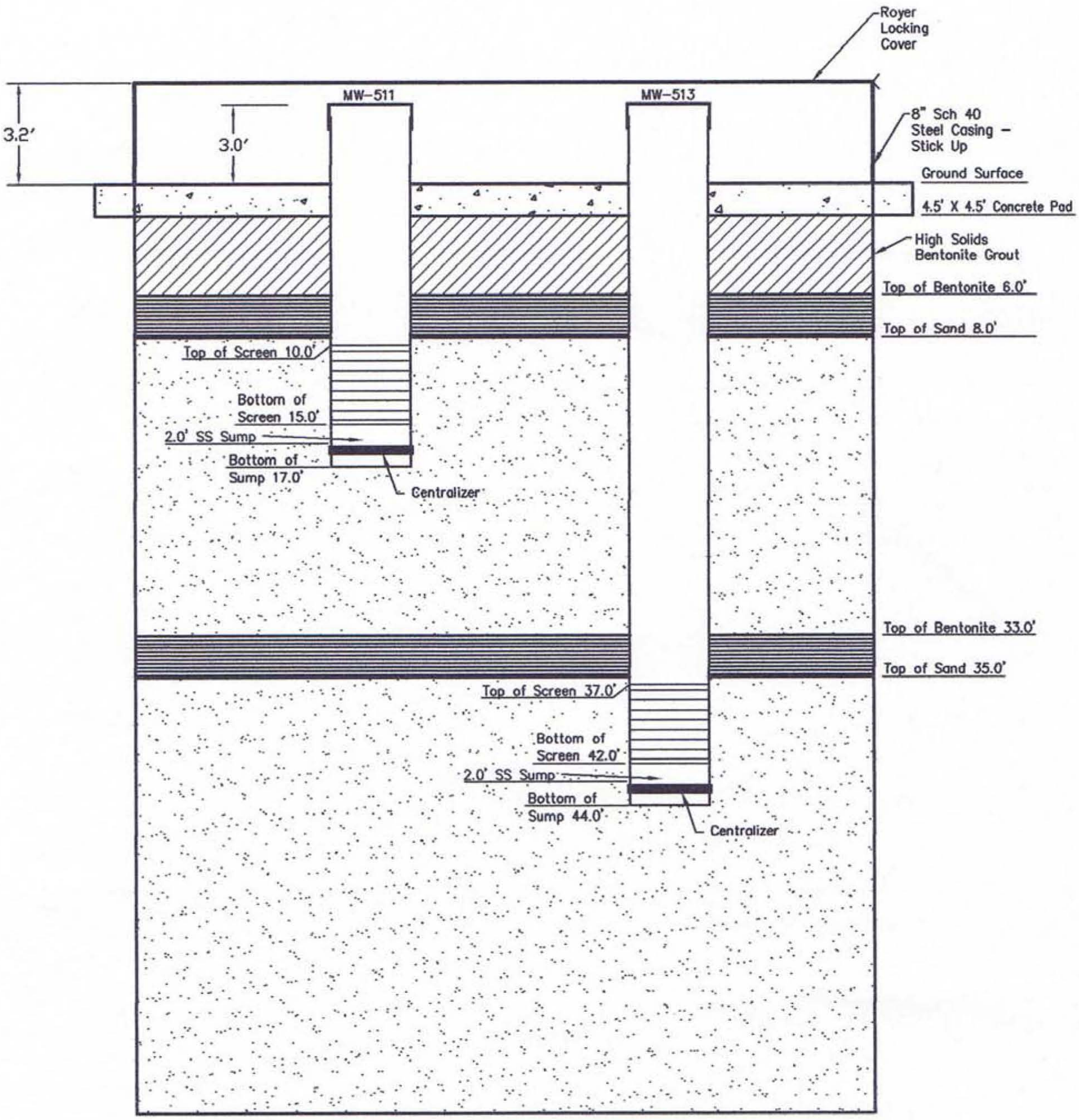
# MONITORING WELL CONSTRUCTION LOG

| | | | |
|---|---|---|---|
| Location Name: | Paducah Gaseous Diffusion Plant | State Assigned # | 8006-5911, 8006-5913 |
| Address: | 5600 Hobbs Road | Agency Interest # | 3059 |
| City/State/Zip: | West Paducah, KY 42053 | Facility Assigned # | MW-511, MW-513 |




CHASE Environmental Group INC

Comments: Drawing not to scale.

2009230

| CHASE Environmental Group INC | Soil Boring Log | Page 1 of 1 |
|---|---|---|

| | |
|---|---|
| Project: Southwest Plume RDSI – C-720 Northeast | Boring Location: MW-511/MW-513 |
| Date Drilled: 8/24/12 | Sampling Method: Dual Tube |
| Date Completed: 8/27/12 | Surface Elevation: |
| Drilling Method: 6.25" ID HSAs | Total Depth: 44.5 |
| Drilling Company: Chase Environmental Group | Logged By: Ken Davis, LATA of Kentucky |

| DEPTH *feet* | SAMPLE NUMBER | BLOW COUNT 6" | PID ppm | REC | FORMATION | GEOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|
| 0.0 | | | | | | Dark Gray to Light Brown Silty GRAVEL w/organics |
| 2.5 | | | | | | Light Brown to Dark Gray SILT, Soft, Moist |
| 15.2 | | | | | | Reddish Yellow to Light Gray Gravely Fine SAND grading to SILT, Soft to Dense, Moist |
| 21.5 | | | | | | Light Gray to Pale Brown Fine SAND w/GRAVEL, Hard, Moist |
| 35.2 | | | | | | White to Reddish Yellow Silty Fine SAND, Soft, Moist |
| 44.5 | | | | | | No Refusal – Boring Terminated @ 44.5 in SAND As Above. |

***Drilling & Remedial Action Contractors***
9470 Hwy. 60 West – Kevil, Kentucky 42053
270-488-2584 Fax: 270-488.2586

UNIFORM KENTUCKY WELL CONSTRUCTION RECORD

Use this form to report installation of monitoring or water wells.

Form must be completed and submitted to the Division of Water within 60 days of well completion.

See instructions below.

One copy to owner and one copy to drillerâ€™s files.

| | | | | | |
|---|---|---|---|---|---|
| Owner Name(*) | United States Department of Energy | | | | |
| Owner First Name (*) | NA | Owner Last Name(*) | NA | | |
| Owner Address(*) | 5600 Hobbs Road | | | | |
| Owner City(*) | West Paducah | State(*) | Kentucky | Owner Zip(*) | 42086 |
| Owner Phone(*) | 270-441-6800 | Owner eMail | | | |

| | | | | | |
|---|---|---|---|---|---|
| Site Name(*) | Paducah Gaseous Diffusion Plant | | | | |
| Site Address(*) | 5600 Hobbs Road | | | | |
| Site City(*) | West Paducah | State(*) | Kentucky | Site Zip(*) | 42086 |
| Site Phone | 270-441-6800 | Site eMail | | | |
| Well Latitude(*) DMS to DD Converter | 37.114 | Well Longitude(*) | -88.815 | Method(*) | Map Grade GPS - Differentially Corrected |

| | | | |
|---|---|---|---|
| Agency Interest (AI) Number | 3059 | Facility Type & ID | CERCLA |

| | | | |
|---|---|---|---|
| USGS Topo Map(*) | HEATH | County(*) | McCracken |
| Surface elevation (ft) | 370 | Elevation determined by | Topographic map interpolation - digitized |
| Physiographic Region(*) | Jackson Purchase | Well Use(*) | Monitoring well - compliance |
| Drilling Method(*) | Auger - hollow stem | Well Status(*) | active |
| Wellhead(*) | Locking Cap | Well Condition(*) | Functioning properly |

| | |
|---|---|
| Kentucky Well ID (AKGWA) Number (*) | 8006-5911 |
| Owner Well ID | MW-511 |
| Work Start Date(*) | 08/24/2012 |
| Work End Date(*) | 08/27/2012 |
| Total depth (ft)(*) | 17.0 |
| Depth to bedrock (ft) | |
| Static water level (ft) | |
| SWL method(*) | Undetermined |
| Casing height above surface (in) | |

**WATER WELLS ONLY**

| | |
|---|---|
| Estimated well yield | |
| Well Yield Method | |
| Well service (# of people served) | |
| Disinfectant amount | |
| Disinfectant type | |
| Pitless adapter installed | |
| Pump installed | |
| Depth to intake (ft) | |

**Apparent quality and odor:**

| | |
|---|---|
| Appearance | |
| Odor Type | |
| Odor-Level | |

**Coliform Test**

| | |
|---|---|
| Coliform test type | |
| Coliform test results | or # colonies per 100 ml |
| Date Sampled | |
| Date Analyzed | |

Save For Future Retrieval | Submit to DEP

Casing / Open Borehole

| | From depth (ft)(*) | To depth (ft)(*) | Borehole diameter (in)(*) | Casing diameter (in)(*) | Casing type(*) |
|---|---|---|---|---|---|
| Delete | 0 | 10.0 | 10.5 | 2 | Steel - stainless |
| Delete | 15.0 | 17.0 | 10.5 | 2 | Steel - stainless |
| Add New | | | | | |

Screen

| | From depth (ft)(*)(*) | To depth (ft)(*)(*) | Borehole diameter (in)(*)(*) | Screen diameter (in)(*)(*) | Screen Type(*)(*) | Screen slot size(*)(*) |
|---|---|---|---|---|---|---|
| Delete | 10.0 | 15.0 | 10.5 | 2 | Steel - stainless | 0.010 |
| Add New | | | | | | |

Annulus fill and seal

| | Section(*) | From depth (ft)(*) | To depth (ft)(*) | Material(*) |
|---|---|---|---|---|
| Delete | Grout | 1 | 6.0 | Bentonite |
| Delete | Seal | 6.0 | 8.0 | Bentonite |
| Delete | Filter Pack | 8.0 | 33.0 | Sand |
| Add New | | | | |

Lithologic log

| | From depth (ft)(*) | To depth (ft)(*) | Description(*) |
|---|---|---|---|
| Add New | | | |

| | | |
|---|---|---|
| Site Map/Sketch Map(*) | | Browse... |
| Well Diagram (monitoring well) | | Browse... |
| Coliform analysis (if applicable) | | Browse... |
| Signed variance (if applicable) | | Browse... |
| Other laboratory analysis report (if applicable) | | Browse... |
| Casing/Screen Supplemental Info | | Browse... |

| | |
|---|---|
| Comments | This is the shallow well in a 2 well nested set. |

Affirmation: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. By submitting data, this transmission constitutes my signature and I am responsible for any and all content submitted either by me or by the people I represent.

| | | | |
|---|---|---|---|
| Signature of certified driller & PIN(*) | Todd W Mills | Date Signed(*) | 03/27/2013 |
| Driller First Name(*) | Todd | Driller Last Name(*) | Mills |
| Certification Number (*) | 0344-0454-00 | Certification Company(*) | Chase Environmental Group, Inc. |

UNIFORM KENTUCKY WELL CONSTRUCTION RECORD

Use this form to report installation of monitoring or water wells.

Form must be completed and submitted to the Division of Water within 60 days of well completion.

See instructions below.

One copy to owner and one copy to drillerâ€™s files.

| | | | | | |
|---|---|---|---|---|---|
| Owner Name(*) | United States Department of Energy | | | | |
| Owner First Name (*) | NA | Owner Last Name(*) | NA | | |
| Owner Address(*) | 5600 Hobbs Road | | | | |
| Owner City(*) | West Paducah | State(*) | Kentucky | Owner Zip(*) | 42086 |
| Owner Phone(*) | 270-441-6800 | Owner eMail | | | |

| | | | | | |
|---|---|---|---|---|---|
| Site Name(*) | Paducah Gaseous Diffusion Plant | | | | |
| Site Address(*) | 5600 Hobbs Road | | | | |
| Site City(*) | West Paducah | State(*) | Kentucky | Site Zip(*) | 42086 |
| Site Phone | 270-441-6800 | Site eMail | | | |
| Well Latitude(*) DMS to DD Converter | 37.114 | Well Longitude(*) | -88.815 | Method(*) | Map Grade GPS - Differentially Corrected |

| | | | | |
|---|---|---|---|---|
| Agency Interest (AI) Number | 3059 | Facility Type & ID | CERCLA | |

| | | | |
|---|---|---|---|
| USGS Topo Map(*) | HEATH | County(*) | McCracken |
| Surface elevation (ft) | | Elevation determined by | Topographic map interpolation - digitized |
| Physiographic Region(*) | Jackson Purchase | Well Use(*) | Monitoring well - compliance |
| Drilling Method(*) | Auger - hollow stem | Well Status(*) | active |
| Wellhead(*) | Locking Cap | Well Condition(*) | Functioning properly |

| | |
|---|---|
| Kentucky Well ID (AKGWA) Number (*) | 8006-5913 |
| Owner Well ID | MW-513 |
| Work Start Date(*) | 08/24/2012 |
| Work End Date(*) | 08/27/2012 |
| Total depth (ft)(*) | 44.0 |
| Depth to bedrock (ft) | |
| Static water level (ft) | |
| SWL method(*) | Undetermined |
| Casing height above surface (in) | |

Casing / Open Borehole

| | From depth (ft)(*) | To depth (ft)(*) | Borehole diameter (in)(*) | Casing diameter (in)(*) | Casing type(*) |
|---|---|---|---|---|---|
| Delete | 0 | 37.0 | 10.5 | 2 | Steel - stainless |
| Delete | 42.0 | 44.0 | 10.5 | 2 | Steel - stainless |
| Add New | | | | | |

Screen

| | From depth (ft)(*)(*) | To depth (ft)(*)(*) | Borehole diameter (in)(*)(*) | Screen diameter (in)(*)(*) | Screen Type(*)(*) | Screen slot size(*)(*) |
|---|---|---|---|---|---|---|
| Delete | 37.0 | 42.0 | 10.5 | 2 | Steel - stainless | 0.010 |
| Add New | | | | | | |

Annulus fill and seal

| | Section(*) | From depth (ft)(*) | To depth (ft)(*) | Material(*) |
|---|---|---|---|---|
| Delete | Grout | 1 | 6.0 | Bentonite |
| Delete | Seal | 6.0 | 8.0 | Bentonite |
| Delete | Filter Pack | 8.0 | 33.0 | Sand |
| Delete | Seal | 33.0 | 35.0 | Bentonite |
| Delete | Filter Pack | 35.0 | 44.5 | Sand |
| Add New | | | | |

Lithologic log

| | From depth (ft)(*) | To depth (ft)(*) | Description(*) |
|---|---|---|---|
| Add New | | | |

| | | |
|---|---|---|
| Site Map/Sketch Map(*) | | Browse... |
| Well Diagram (monitoring well) | | Browse... |
| Coliform analysis (if applicable) | | Browse... |
| Signed variance (if applicable) | | Browse... |
| Other laboratory analysis report (if applicable) | | Browse... |
| Casing/Screen Supplemental Info | | Browse... |

| | |
|---|---|
| Comments | This is the deep well in a 2 well nested set. |

Affirmation: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. By submitting data, this transmission constitutes my signature and I am responsible for any and all content submitted either by me or by the people I represent.

| | | | |
|---|---|---|---|
| Signature of certified driller & PIN(*) | Todd W Mills | Date Signed(*) | 03/27/2013 |
| Driller First Name(*) | Todd | Driller Last Name(*) | Mills |
| Certification Number (*) | 0344-0454-00 | Certification Company(*) | Chase Environmental Group, Inc. |

WATER WELLS ONLY

| | |
|---|---|
| Estimated well yield | |
| Well Yield Method | |
| Well service (# of people served) | |
| Disinfectant amount | |
| Disinfectant type | |
| Pitless adapter installed | |
| Pump installed | |
| Depth to intake (ft) | |

**Apparent quality and odor:**

| | |
|---|---|
| Appearance | |
| Odor Type | |
| Odor-Level | |

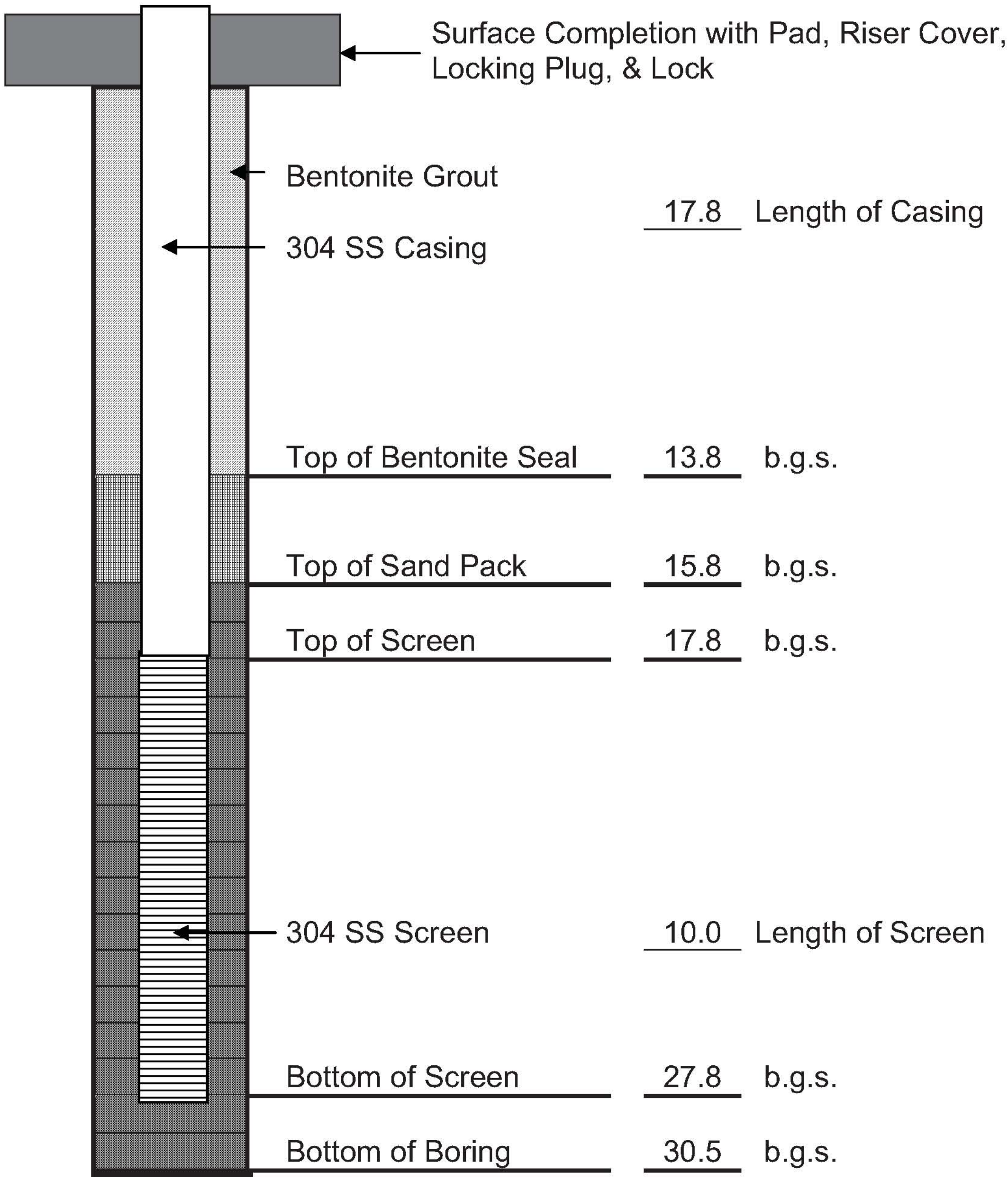
**Coliform Test**

| | |
|---|---|
| Coliform test type | |
| Coliform test results | or # colonies per 100 ml |
| Date Sampled | |
| Date Analyzed | |

Save For Future Retrieval | Submit to DEP

# MONITORING WELL CONSTRUCTION LOG

| | | | |
|---|---|---|---|
| Location Name: | Paducah Gaseous Diffusion Plant | State Assigned # | 8006-5912 |
| Address: | 5600 Hobbs Road | AI # | 3059 |
| City/State/Zip: | West Paducah, KY | Facility Assigned # | MW-512 |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Depth to Groundwater | Dry | Total Depth of Boring (ft) | 30.5 | Total Depth of Well (ft) | 29.8 | Borehole Diameter | 8.5 |
| Well Diameter | 2.0 | Slot Size | 0.010 | Drilling Unconsolidated | 30.5 | Drilling in Consolidated | -- |
| Date: | 08/24/12 | Completed By: | Todd W. Mills | | | Top of Casing | Unk |

CEG CHASE Environmental Group INC

Comments: Drawing not to scale.

CHASE Environmental Group INC

# Soil Boring Log



| | |
|---|---|
| Project: Southwest Plume RDSI – C-720 Northeast | Boring Location: MW-512 |
| Date Drilled: 8/22/12 | Sampling Method: Dual Tube |
| Date Completed: 8/24/12 | Surface Elevation: |
| Drilling Method: 4.25" ID HSAs | Total Depth: 30.5 |
| Drilling Company: Chase Environmental Group | Logged By: Ken Davis, LATA of Kentucky |

| DEPTH *feet* | SAMPLE NUMBER | BLOW COUNT 6" | PID ppm | REC | FORMATION | GEOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|
| 0.0 | | | | | | Topsoil w/ Organics Mixed with Pea GRAVEL, Loose, Moist |
| 1.2 | | | | | | White to Light Brown SILT, Soft, Moist |
| 20.0 | | | | | | Reddish Yellow to Light Gray Gravely Fine SAND grading to SILT, Soft to Dense, Moist |
| 22.2 | | | | | | Reddish Yellow to Pinkish Gray Sandy to Clayey GRAVEL, Loose, Moist |
| 23.7 | | | | | | Light Gray to Pale Brown Silty to Gravely Fine SAND, Firm, Moist |
| 30.5 | | | | | | No Refusal – Boring Terminated @ 30.5 in SAND As Above. |

*Drilling & Remedial Action Contractors*
9470 Hwy. 60 West – Kevil, Kentucky 42053
270-488-2584 Fax: 270-488.2586

UNIFORM KENTUCKY WELL CONSTRUCTION RECORD

Use this form to report installation of monitoring or water wells.

Form must be completed and submitted to the Division of Water within 60 days of well completion.

See instructions below.

One copy to owner and one copy to drillerâ€™s files.

| | |
|---|---|
| Owner Name(*) | United States Department of Energy |
| Owner First Name (*) | NA |
| Owner Last Name(*) | NA |
| Owner Address(*) | 5600 Hobbs Road |
| Owner City(*) | West Paducah |
| State(*) | Kentucky |
| Owner Zip(*) | 42086 |
| Owner Phone(*) | 270-441-6800 |
| Owner eMail | |

| | |
|---|---|
| Site Name(*) | Paducah Gaseous Diffusion Plant |
| Site Address(*) | 5600 Hobbs Road |
| Site City(*) | West Paducah |
| State(*) | Kentucky |
| Site Zip(*) | 42086 |
| Site Phone | 270-441-6800 |
| Site eMail | |
| Well Latitude(*) DMS to DD Converter | 37.114 |
| Well Longitude(*) | -88.814 |
| Method(*) | Map Grade GPS - Differentially Corrected |
| Agency Interest (AI) Number | 3059 |
| Facility Type & ID | CERCLA |

| | | | |
|---|---|---|---|
| USGS Topo Map(*) | HEATH | County(*) | McCracken |
| Surface elevation (ft) | 370 | Elevation determined by | Topographic map interpolation - digitized |
| Physiographic Region(*) | Jackson Purchase | Well Use(*) | Monitoring well - compliance |
| Drilling Method(*) | Auger - hollow stem | Well Status(*) | active |
| Wellhead(*) | Locking Cap | Well Condition(*) | Functioning properly |

Casing / Open Borehole

| | From depth (ft)(*) | To depth (ft)(*) | Borehole diameter (in)(*) | Casing diameter (in)(*) | Casing type(*) |
|---|---|---|---|---|---|
| Delete | 0 | 17.8 | 8.5 | 2 | Steel - stainless |
| Delete | 27.8 | 29.8 | 8.5 | 2 | Steel - stainless |
| Add New | | | | | |

Screen

| | From depth (ft)(*)(*) | To depth (ft)(*)(*) | Borehole diameter (in) (*)(*) | Screen diameter (in)(*)(*) | Screen Type(*)(*) | Screen slot size(*)(*) |
|---|---|---|---|---|---|---|
| Delete | 17.8 | 27.8 | 8.5 | 2 | Steel - stainless | 0.010 |
| Add New | | | | | | |

Annulus fill and seal

| | Section(*) | From depth (ft)(*) | To depth (ft)(*) | Material(*) |
|---|---|---|---|---|
| Delete | Grout | 1 | 13.8 | Bentonite |
| Delete | Seal | 13.8 | 15.8 | Bentonite |
| Delete | Filter Pack | 15.8 | 30.5 | Sand |
| Add New | | | | |

Lithologic log

| | From depth (ft)(*) | To depth (ft)(*) | Description(*) |
|---|---|---|---|
| Add New | | | |

| | |
|---|---|
| Site Map/Sketch Map(*) | Browse... |
| Well Diagram (monitoring well) | Browse... |
| Coliform analysis (if applicable) | Browse... |
| Signed variance (if applicable) | Browse... |
| Other laboratory analysis report (if applicable) | Browse... |
| Casing/Screen Supplemental Info | Browse... |
| Comments | |

Affirmation: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. By submitting data, this transmission constitutes my signature and I am responsible for any and all content submitted either by me or by the people I represent.

| | | | |
|---|---|---|---|
| Signature of certified driller & PIN(*) | Todd W Mills | Date Signed(*) | 03/27/2013 |
| Driller First Name(*) | Todd | Driller Last Name(*) | Mills |
| Certification Number (*) | 0344-0454-00 | Certification Company(*) | Chase Environmental Group, Inc. |

| | |
|---|---|
| Kentucky Well ID (AKGWA) Number (*) | 8006-5912 |
| Owner Well ID | MW-512 |
| Work Start Date(*) | 08/22/2012 |
| Work End Date(*) | 08/24/2012 |
| Total depth (ft)(*) | 30.5 |
| Depth to bedrock (ft) | |
| Static water level (ft) | |
| SWL method(*) | Undetermined |
| Casing height above surface (in) | |

**WATER WELLS ONLY**

| | |
|---|---|
| Estimated well yield | |
| Well Yield Method | |
| Well service (# of people served) | |
| Disinfectant amount | |
| Disinfectant type | |
| Pitless adapter installed | |
| Pump installed | |
| Depth to intake (ft) | |

**Apparent quality and odor:**

| | |
|---|---|
| Appearance | |
| Odor Type | |
| Odor-Level | |

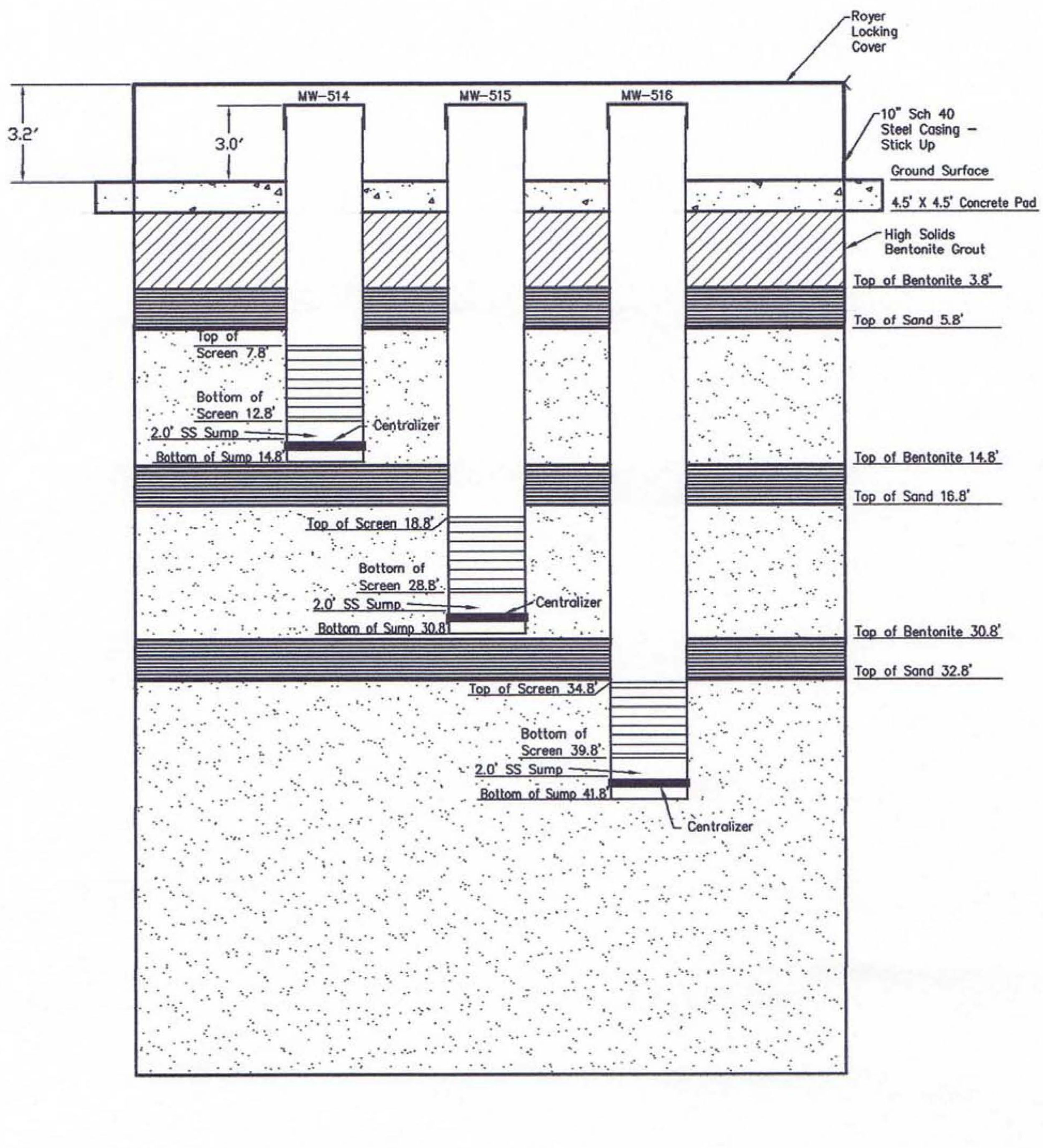
**Coliform Test**

| | |
|---|---|
| Coliform test type | |
| Coliform test results | or # colonies per 100 ml |
| Date Sampled | |
| Date Analyzed | |

Save For Future Retrieval | Submit to DEP

# MONITORING WELL CONSTRUCTION LOG

| | | | |
|---|---|---|---|
| Location Name: | Paducah Gaseous Diffusion Plant | State Assigned # | 8006-5914, 8006-5915, 8006-5916 |
| Address: | 5600 Hobbs Road | Agency Interest # | 3059 |
| City/State/Zip: | West Paducah, KY 42053 | Facility Assigned # | MW-514, MW-515, MW-516 |




CHASE Environmental Group INC

Comments: Drawing not to scale.

2009230

Chase Environmental Group INC

# Soil Boring Log



| | |
|---|---|
| Project: Southwest Plume RDSI | Boring Location: MW-514/MW-515/MW-516 |
| Date Drilled: 8/23/12 | Sampling Method: Dual Tube |
| Date Completed: 8/27/12 | Surface Elevation: |
| Drilling Method: 8.25" ID HSAs | Total Depth: 44.5 |
| Drilling Company: Chase Environmental Group | Logged By: Ken Davis, LATA of Kentucky |

| DEPTH *feet* | SAMPLE NUMBER | BLOW COUNT 6" | PID ppm | REC | FORMATION | GEOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|
| 0.0 | | | | | | Unclassified Select Fill |
| 2.5 | | | | | | Light Gray SILT, Firm, Moist |
| 16.5 | | | | | | Light Gray to Reddish Yellow Gravely to Silty SAND, Dense, Moist |
| 21.3 | | | | | | Reddish Yellow to White Silty Fine SAND, Firm, Moist |
| 25.9 | | | | | | Reddish Yellow to Pale Brown Silty Fine SAND and Gravel, Dense, Moist |
| 37.4 | | | | | | Pale Brown to Pink SILT, Soft, Moist |
| 44.5 | | | | | | No Refusal – Boring Terminated @ 44.5 in SILT As Above. |

*Drilling & Remedial Action Contractors*
9470 Hwy. 60 West – Kevil, Kentucky 42053
270-488-2584 Fax: 270-488.2586

UNIFORM KENTUCKY WELL CONSTRUCTION RECORD

Use this form to report installation of monitoring or water wells.

Form must be completed and submitted to the Division of Water within 60 days of well completion.

See instructions below.

One copy to owner and one copy to drillerâ€™s files.

| | |
|---|---|
| Owner Name(*) | United States Department of Energy |
| Owner First Name (*) | NA |
| Owner Last Name(*) | NA |
| Owner Address(*) | 5600 Hobbs Road |
| Owner City(*) | West Paducah |
| State(*) | Kentucky |
| Owner Zip(*) | 42086 |
| Owner Phone(*) | 270-441-6800 |
| Owner eMail | |

| | |
|---|---|
| Site Name(*) | Paducah Gaseous Diffusion Plant |
| Site Address(*) | 5600 Hobbs Road |
| Site City(*) | West Paducah |
| State(*) | Kentucky |
| Site Zip(*) | 42086 |
| Site Phone | 270-441-6800 |
| Site eMail | |
| Well Latitude(*) DMS to DD Converter | 37.112 |
| Well Longitude(*) | -88.815 |
| Method(*) | Map Grade GPS - Differentially Corrected |

| | |
|---|---|
| Agency Interest (AI) Number | 3059 |
| Facility Type & ID | CERCLA |
| USGS Topo Map(*) | HEATH |
| County(*) | McCracken |
| Surface elevation (ft) | 370 |
| Elevation determined by | Topographic map interpolation - digitized |
| Physiographic Region(*) | Jackson Purchase |
| Well Use(*) | Monitoring well - compliance |
| Drilling Method(*) | Auger - hollow stem |
| Well Status(*) | active |
| Wellhead(*) | Locking Cap |
| Well Condition(*) | Functioning properly |

| | |
|---|---|
| Kentucky Well ID (AKGWA) Number (*) | 8006-5914 |
| Owner Well ID | MW-514 |
| Work Start Date(*) | 08/23/2012 |
| Work End Date(*) | 08/27/2012 |
| Total depth (ft)(*) | 14.8 |
| Depth to bedrock (ft) | |
| Static water level (ft) | |
| SWL method(*) | Undetermined |
| Casing height above surface (in) | |

Casing / Open Borehole

| | From depth (ft)(*) | To depth (ft)(*) | Borehole diameter (in)(*) | Casing diameter (in)(*) | Casing type(*) |
|---|---|---|---|---|---|
| Delete | 0 | 7.8 | 12.5 | 2 | Steel - stainless |
| Delete | 12.8 | 14.8 | 12.5 | 2 | Steel - stainless |
| Add New | | | | | |

Screen

| | From depth (ft)(*)(*) | To depth (ft)(*)(*) | Borehole diameter (in)(*)(*) | Screen diameter (in)(*)(*) | Screen Type(*)(*) | Screen slot size(*)(*) |
|---|---|---|---|---|---|---|
| Delete | 7.8 | 12.8 | 12.5 | 2 | Steel - stainless | 0.010 |
| Add New | | | | | | |

Annulus fill and seal

| | Section(*) | From depth (ft)(*) | To depth (ft)(*) | Material(*) |
|---|---|---|---|---|
| Delete | Grout | 1 | 3.8 | Bentonite |
| Delete | Seal | 3.8 | 5.8 | Bentonite |
| Delete | Filter Pack | 5.8 | 14.8 | Sand |
| Add New | | | | |

Lithologic log

| | From depth (ft)(*) | To depth (ft)(*) | Description(*) |
|---|---|---|---|
| Add New | | | |

| | |
|---|---|
| Site Map/Sketch Map(*) | Browse... |
| Well Diagram (monitoring well) | Browse... |
| Coliform analysis (if applicable) | Browse... |
| Signed variance (if applicable) | Browse... |
| Other laboratory analysis report (if applicable) | Browse... |
| Casing/Screen Supplemental Info | Browse... |
| Comments | This is the shallow well in a 3 well nested set. |

**WATER WELLS ONLY**

| | |
|---|---|
| Estimated well yield | |
| Well Yield Method | |
| Well service (# of people served) | |
| Disinfectant amount | |
| Disinfectant type | |
| Pitless adapter installed | |
| Pump installed | |
| Depth to intake (ft) | |

**Apparent quality and odor:**

| | |
|---|---|
| Appearance | |
| Odor Type | |
| Odor-Level | |

**Coliform Test**

| | |
|---|---|
| Coliform test type | |
| Coliform test results | or # colonies per 100 ml |
| Date Sampled | |
| Date Analyzed | |

Save For Future Retrieval | Submit to DEP

Affirmation: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. By submitting data, this transmission constitutes my signature and I am responsible for any and all content submitted either by me or by the people I represent.

| | | | |
|---|---|---|---|
| Signature of certified driller & PIN(*) | Todd W Mills | Date Signed(*) | 03/27/2013 |
| Driller First Name(*) | Todd | Driller Last Name(*) | Mills |
| Certification Number (*) | 0344-0454-00 | Certification Company(*) | Chase Environmental Group, Inc. |

UNIFORM KENTUCKY WELL CONSTRUCTION RECORD

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See instructions below.

One copy to owner and one copy to drillerâ€™s files.

| | | | | | |
|---|---|---|---|---|---|
| Owner Name(*) | United States Department of Energy | | | | |
| Owner First Name (*) | NA | Owner Last Name(*) | NA | | |
| Owner Address(*) | 5600 Hobbs Road | | | | |
| Owner City(*) | West Paducah | State(*) | Kentucky | Owner Zip(*) | 42086 |
| Owner Phone(*) | 270-441-6800 | Owner eMail | | | |

| | | | | | |
|---|---|---|---|---|---|
| Site Name(*) | Paducah Gaseous Diffusion Plant | | | | |
| Site Address(*) | 5600 Hobbs Road | | | | |
| Site City(*) | West Paducah | State(*) | Kentucky | Site Zip(*) | 42086 |
| Site Phone | 270-441-6800 | Site eMail | | | |
| Well Latitude(*) DMS to DD Converter | 37.112 | Well Longitude(*) | -88.815 | Method(*) | Map Grade GPS - Differentially Corrected |

| | | | |
|---|---|---|---|
| Agency Interest (AI) Number | 3059 | Facility Type & ID | CERCLA |

| | | | |
|---|---|---|---|
| USGS Topo Map(*) | HEATH | County(*) | McCracken |
| Surface elevation (ft) | 370 | Elevation determined by | Topographic map interpolation - digitized |
| Physiographic Region(*) | Jackson Purchase | Well Use(*) | Monitoring well - compliance |
| Drilling Method(*) | Auger - hollow stem | Well Status(*) | active |
| Wellhead(*) | Locking Cap | Well Condition(*) | Functioning properly |

Casing / Open Borehole

| | From depth (ft)(*) | To depth (ft)(*) | Borehole diameter (in)(*) | Casing diameter (in)(*) | Casing type(*) |
|---|---|---|---|---|---|
| Delete | 0 | 18.8 | 12.5 | 2 | Steel - stainless |
| Delete | 28.8 | 30.8 | 12.5 | 2 | Steel - stainless |
| Add New | | | | | |

Screen

| | From depth (ft)(*)(*) | To depth (ft)(*)(*) | Borehole diameter (in) (*)(*) | Screen diameter (in)(*) (*) | Screen Type(*)(*) | Screen slot size(*)(*) |
|---|---|---|---|---|---|---|
| Delete | 18.8 | 28.8 | 12.5 | 2 | Steel - stainless | 0.010 |
| Add New | | | | | | |

Annulus fill and seal

| | Section(*) | From depth (ft)(*) | To depth (ft)(*) | Material(*) |
|---|---|---|---|---|
| Delete | Grout | 1 | 3.8 | Bentonite |
| Delete | Seal | 3.8 | 5.8 | Bentonite |
| Delete | Filter Pack | 5.8 | 14.8 | Sand |
| Delete | Seal | 14.8 | 16.8 | Bentonite |
| Delete | Filter Pack | 16.8 | 30.8 | Sand |
| Add New | | | | |

Lithologic log

| | From depth (ft)(*) | To depth (ft)(*) | Description(*) |
|---|---|---|---|
| Add New | | | |

| | | |
|---|---|---|
| Site Map/Sketch Map(*) | | Browse... |
| Well Diagram (monitoring well) | | Browse... |
| Coliform analysis (if applicable) | | Browse... |
| Signed variance (if applicable) | | Browse... |
| Other laboratory analysis report (if applicable) | | Browse... |
| Casing/Screen Supplemental Info | | Browse... |

| | |
|---|---|
| Comments | This is the intermediate well in a 3 well nested set. |

Affimation: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. By submitting data, this transmission constitutes my signature and I am responsible for any and all content submitted either by me or by the people I represent.

| | | | |
|---|---|---|---|
| Signature of certified driller & PIN(*) | Todd W Mills | Date Signed(*) | 03/27/2013 |
| Driller First Name(*) | Todd | Driller Last Name(*) | Mills |
| Certification Number (*) | 0344-0454-00 | Certification Company(*) | Chase Environmental Group, Inc. |

| | |
|---|---|
| Kentucky Well ID (AKGWA) Number (*) | 8006-5915 |
| Owner Well ID | MW-515 |
| Work Start Date(*) | 08/23/2012 |
| Work End Date(*) | 08/27/2012 |
| Total depth (ft)(*) | 30.8 |
| Depth to bedrock (ft) | |
| Static water level (ft) | |
| SWL method(*) | Undetermined |
| Casing height above surface (in) | |

**WATER WELLS ONLY**

| | |
|---|---|
| Estimated well yield | |
| Well Yield Method | |
| Well service (# of people served) | |
| Disinfectant amount | |
| Disinfectant type | |
| Pitless adapter installed | |
| Pump installed | |
| Depth to intake (ft) | |

**Apparent quality and odor:**

| | |
|---|---|
| Appearance | |
| Odor Type | |
| Odor-Level | |

**Coliform Test**

| | |
|---|---|
| Coliform test type | |
| Coliform test results | or # colonies per 100 ml |
| Date Sampled | |
| Date Analyzed | |

Save For Future Retrieval | Submit to DEP

UNIFORM KENTUCKY WELL CONSTRUCTION RECORD

Use this form to report installation of monitoring or water wells.

Form must be completed and submitted to the Division of Water within 60 days of well completion.

See instructions below.

One copy to owner and one copy to drillerâ€™s files.

| | | | | | |
|---|---|---|---|---|---|
| Owner Name(*) | United States Department of Energy | | | | |
| Owner First Name (*) | NA | Owner Last Name(*) | NA | | |
| Owner Address(*) | 5600 Hobbs Road | | | | |
| Owner City(*) | West Paducah | State(*) | Kentucky | Owner Zip(*) | 42086 |
| Owner Phone(*) | 270-441-6800 | Owner eMail | | | |

| | | | | | |
|---|---|---|---|---|---|
| Site Name(*) | Paducah Gaseous Diffusion Plant | | | | |
| Site Address(*) | 5600 Hobbs Road | | | | |
| Site City(*) | West Paducah | State(*) | Kentucky | Site Zip(*) | 42086 |
| Site Phone | 270-441-6800 | Site eMail | | | |
| Well Latitude(*) DMS to DD Converter | 37.112 | Well Longitude(*) | -88.815 | Method(*) | Map Grade GPS - Differentially Corrected |

| | | | |
|---|---|---|---|
| Agency Interest (AI) Number | 3059 | Facility Type & ID | CERCLA |

| | | | |
|---|---|---|---|
| USGS Topo Map(*) | HEATH | County(*) | McCracken |
| Surface elevation (ft) | 370 | Elevation determined by | Topographic map interpolation - digitized |
| Physiographic Region(*) | Jackson Purchase | Well Use(*) | Monitoring well - compliance |
| Drilling Method(*) | Auger - hollow stem | Well Status(*) | active |
| Wellhead(*) | Locking Cap | Well Condition(*) | Functioning properly |

Casing / Open Borehole

| | From depth (ft)(*) | To depth (ft)(*) | Borehole diameter (in)(*) | Casing diameter (in)(*) | Casing type(*) |
|---|---|---|---|---|---|
| Delete | 0 | 34.8 | 12.5 | 2 | Steel - stainless |
| Delete | 39.8 | 41.8 | 12.5 | 2 | Steel - stainless |
| Add New | | | | | |

Screen

| | From depth (ft)(*)(*) | To depth (ft)(*)(*) | Borehole diameter (in)(*)(*) | Screen diameter (in)(*)(*) | Screen Type(*)(*) | Screen slot size(*)(*) |
|---|---|---|---|---|---|---|
| Delete | 34.8 | 39.8 | 12.5 | 2 | Steel - stainless | 0.010 |
| Add New | | | | | | |

Annulus fill and seal

| | Section(*) | From depth (ft)(*) | To depth (ft)(*) | Material(*) |
|---|---|---|---|---|
| Delete | Grout | 1 | 3.8 | Bentonite |
| Delete | Seal | 3.8 | 5.8 | Bentonite |
| Delete | Filter Pack | 5.8 | 14.8 | Sand |
| Delete | Seal | 14.8 | 16.8 | Bentonite |
| Delete | Filter Pack | 16.8 | 30.8 | Sand |
| Delete | Seal | 30.8 | 32.8 | Bentonite |
| Delete | Filter Pack | 32.8 | 44.5 | Sand |
| Add New | | | | |

Lithologic log

| | From depth (ft)(*) | To depth (ft)(*) | Description(*) |
|---|---|---|---|
| Add New | | | |

| | | |
|---|---|---|
| Site Map/Sketch Map(*) | | Browse... |
| Well Diagram (monitoring well) | | Browse... |
| Coliform analysis (if applicable) | | Browse... |
| Signed variance (if applicable) | | Browse... |
| Other laboratory analysis report (if applicable) | | Browse... |
| Casing/Screen Supplemental Info | | Browse... |

Comments: This is the deep well in a 3 well nested set.

Affimation: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. By submitting data, this transmission constitutes my signature and I am responsible for any and all content submitted either by me or by the people I represent.

| | | | |
|---|---|---|---|
| Signature of certified driller & PIN(*) | Todd W Mills | Date Signed(*) | 03/27/2013 |
| Driller First Name(*) | Todd | Driller Last Name(*) | Mills |
| Certification Number (*) | 0344-0454-00 | Certification Company(*) | Chase Environmental Group, Inc. |

| | |
|---|---|
| Kentucky Well ID (AKGWA) Number (*) | 8006-5916 |
| Owner Well ID | MW-516 |
| Work Start Date(*) | 08/23/2012 |
| Work End Date(*) | 08/27/2012 |
| Total depth (ft)(*) | 44.5 |
| Depth to bedrock (ft) | |
| Static water level (ft) | |
| SWL method(*) | Undetermined |
| Casing height above surface (in) | |

**WATER WELLS ONLY**

| | |
|---|---|
| Estimated well yield | |
| Well Yield Method | |
| Well service (# of people served) | |
| Disinfectant amount | |
| Disinfectant type | |
| Pitless adapter installed | |
| Pump installed | |
| Depth to intake (ft) | |

**Apparent quality and odor:**

| | |
|---|---|
| Appearance | |
| Odor Type | |
| Odor-Level | |

**Coliform Test**

| | |
|---|---|
| Coliform test type | |
| Coliform test results | or # colonies per 100 ml |
| Date Sampled | |
| Date Analyzed | |

Save For Future Retrieval | Submit to DEP

# APPENDIX B

# THREE-DIMENSIONAL CONTAMINATION MODELS (CD)

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# APPENDIX B

## THREE-DIMENSIONAL
## CONTAMINATION MODELS (CD)

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# APPENDIX C

# MODEL SENSITIVITY ANALYSES

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# C.1. SWMU 211-A TCE VOLUME ESTIMATE AND SENSITIVITY ANALYSIS OF ANISOTROPY, MEASURES OF STATISTICAL CONFIDENCE USING HISTORIC (1998 AND 2004) UPPER CONTINENTAL RECHARGE SYSTEM SOIL INVESTIGATION, AND 2012 REMEDIAL DESIGN SUPPORT INVESTIGATION DATA SETS

## C.1.1 PURPOSE

Utilizing the results of soil sampling data provided by LATA Environmental Services of Kentucky, LLC, (LATA Kentucky) Geosyntec has developed estimates of the mass of trichloroethene (TCE) in soils above the Regional Gravel Aquifer (RGA) at Solid Waste Management Unit (SWMU 211-A) 211-A, using C Tech's Environmental Visualization Software (EVS). Provided soil sampling data was collected during evaluation of the Upper Continental Recharge System (UCRS) (1998 and 2004) and Remedial Design Support Investigation (RDSI) (2012) sampling from October 2012 to March 2013. The purpose of this calculation package is to evaluate the sensitivity of TCE mass estimates when interpolating the data using a kriging algorithm by varying the anisotropy of the model and evaluating the statistical confidence of the interpolation.

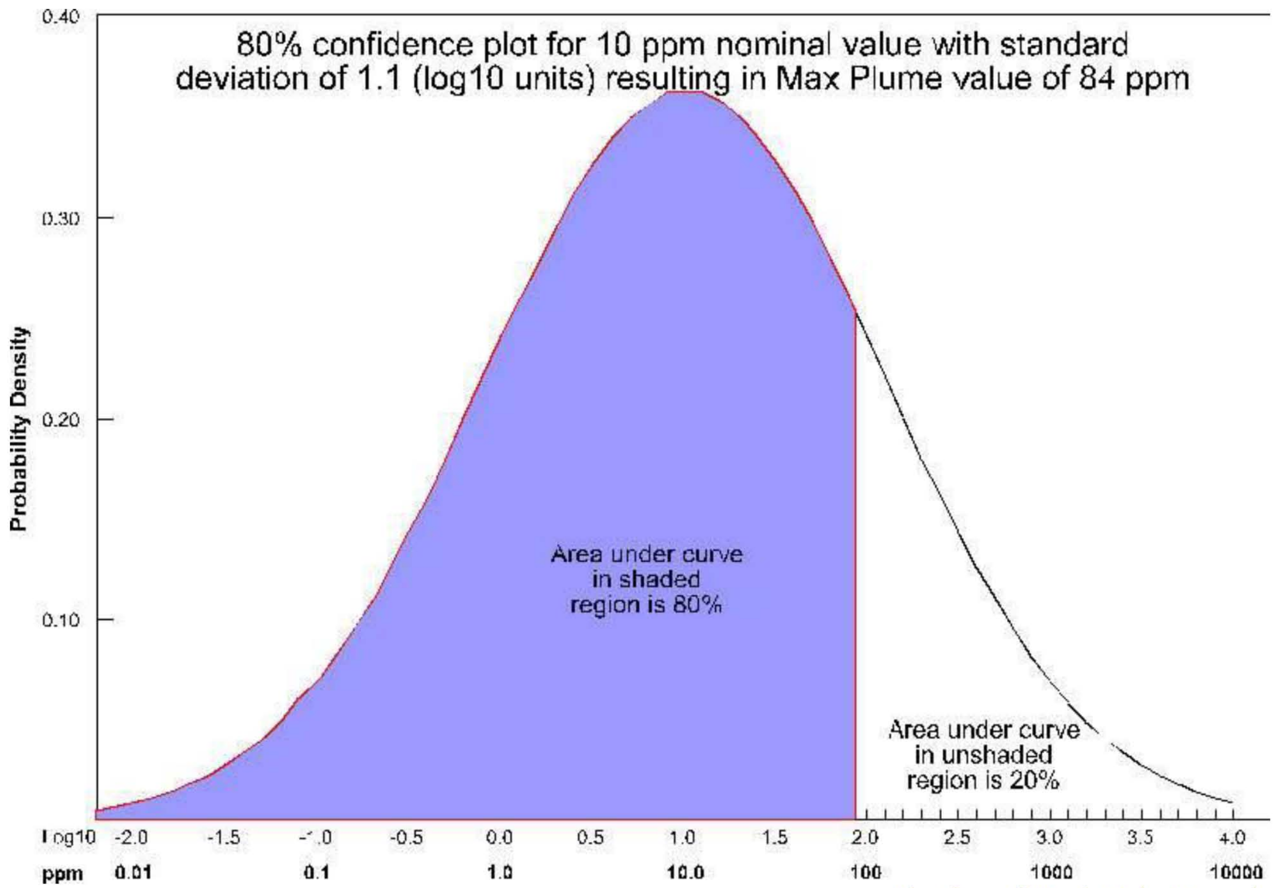
## C.1.2 METHODS

Soil sampling results were interpolated in EVS in order to estimate the volume of TCE in soils. A sensitivity analysis was performed to evaluate the volume of TCE under several different anisotropy ratios: 1, 1.5, 5, and 10. EVS allows for further evaluation of the statistical confidence of the interpolation by providing results at differing user-defined confidence levels. Data were evaluated at 50, 60, 70, 80, and 90% confidence intervals, the results of which are provided in the calculation packages in Appendix C. A site-specific soil density of 1.4 gm/cc was used to calculate TCE mass.

Anisotropy allows the model to consider the effects of anisotropy in the conductivity of soil matrices to fluid flow. In most cases, geologic materials are deposited with platy clay minerals oriented horizontally; thus, flow of water in both the saturated and unsaturated zone can be slower in the vertical direction than in the horizontal direction. Ore deposition also can occur along horizontal or vertical fault or fracture systems. Chemical constituents being transported with flowing fluids, therefore, may show a larger degree of spreading in one or the other direction. The Horiz./Vert. Anisotropy Ratio allows the kriging algorithm to specify a factor to be used to apply biased weighting on data points in horizontal and vertical directions away from a given model node. The default value for fluid flow is 10, which allows data points in a horizontal direction away from a model node to influence the kriged value at that node by a factor of 10 than data points an equal distance away in a vertical direction. A value of 10 typically would be appropriate for dissolved-phase concentrations in an aquifer that is either high-velocity or anisotropic. When the property being modeled is not related to fluid flow or other processes that might be affected by matrix anisotropy, then the recommended value is 1 (i.e., isotropic). Based on observations of data from soil sampling to date in SWMU 211-A, despite the fluid based nature of the release, it is expected that transport is vertically controlled more than horizontally controlled. Therefore the use of a lower anisotropy value is appropriate. Based upon the shape and connectedness of the plume to various sample points, an anisotropy of 1.5 was selected.

EVS can be used to determine the Minimum (Min) and Maximum (Max) Plume, or in this specific case, source area, using a Min-Max algorithm. The Min Plume calculates the minimum estimated size of the source area at a user-specified confidence level. Conversely, the Max Plume calculates the maximum estimated size of the source area at a user-specified confidence level. To determine the confidence level of the interpolation, EVS first calculates the nominal value and associated standard deviation at every node in the model. For the case of Max Plume and 80% confidence, at each node, a maximum value is determined such that 80% of the time, the actual values will fall below the maximum value (for that nominal concentration and standard deviation). This process is shown below as an example directly from the C Tech Help Manual for the case of an assumed nominal value of 10 ppm with a standard deviation of 1.1 (log units). For this case, the maximum value at that node would be approximately 84 ppm. This process is repeated for every node in the model.

For the plot shown below (from the C Tech Help Manual), the entire left portion of the bell curve is shaded. If assessing the minimum value, it would be the right side.




Plot from C Tech Help Manual

EVS allows the model to be gridded using several different techniques including convex hull (the default method) and rectilinear gridding. The convex hull of a set of points in two-dimensional space is the smallest convex area containing the set. In the x-y plane, the convex hull can be visualized as the shape assumed by a rubber band that has been stretched around the set and released to conform as closely as possible to it. EVS grids convex hull regions with quadrilaterals. Smoothing techniques are used to create a grid that has reasonably equal area cells. In rectilinear (a.k.a. uniform) gridding, the grid axes are parallel to the coordinate axes and the cells are always rectangular in cross-section. The positions of all the nodes can be computed knowing only the coordinate extents of the grid (minimum and maximum x, y, and z). In both convex hull and rectilinear gridding, adaptive gridding was used. Adaptive gridding is the localized refinement of a grid to provide higher resolution in the areas or volumes surrounding measured sample data.

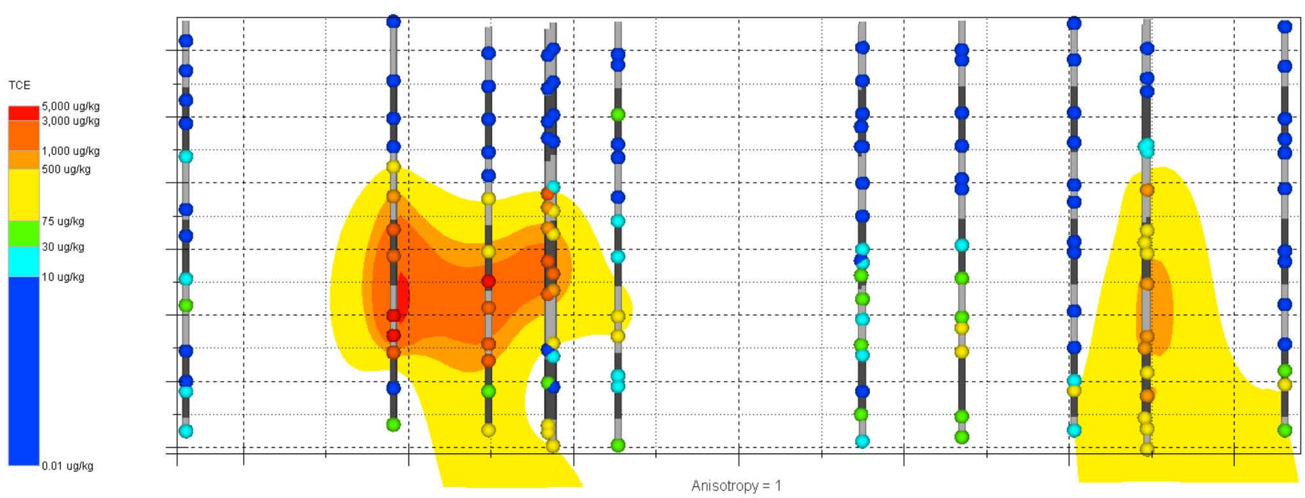
### C.1.3 RESULTS

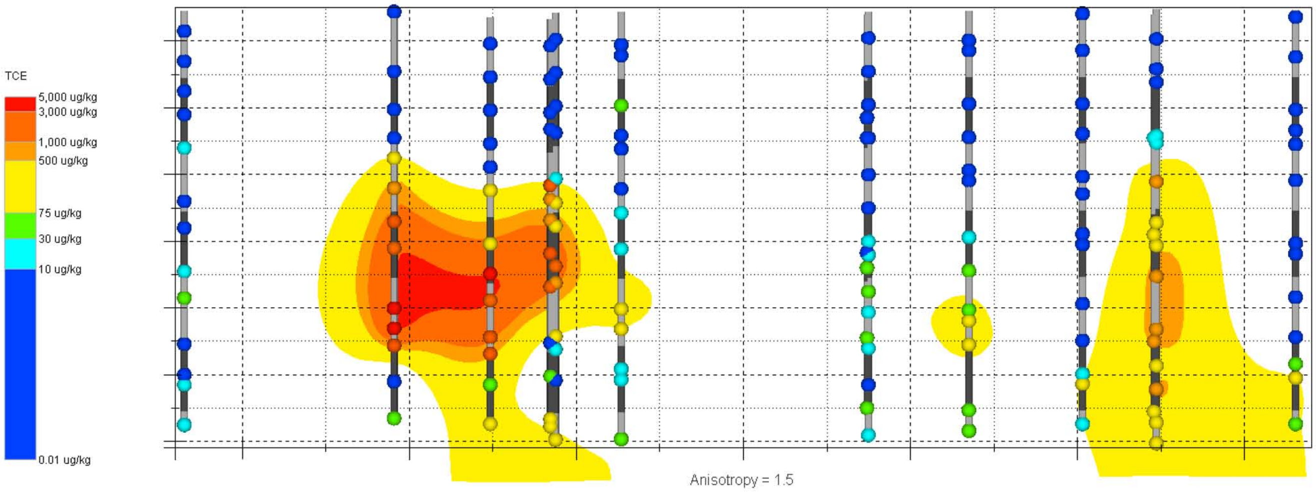
The table below provides the results of the volume estimates in gallons (gal) using the different datasets. The blue shading highlights the 50% nominal source volume estimate and the green shading highlights the results using an anisotropy value of one, which has previously been reported.

**Estimated Volume of TCE (gal) above 75 ug/kg in SWMU 211-A Soils**

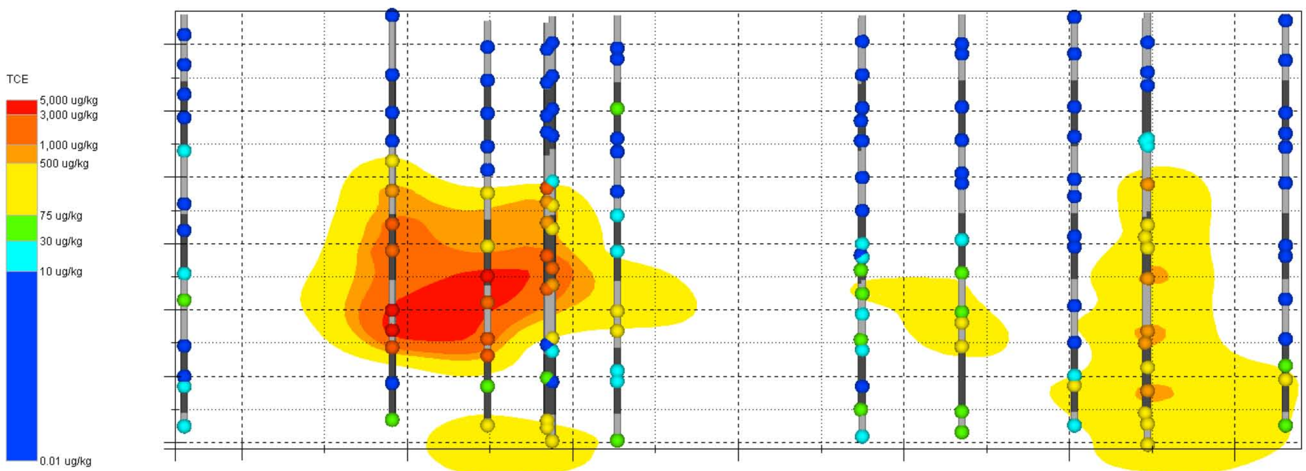
| | Anisotropy | | | |
|---|---|---|---|---|
| **Confidence Level** | **1** | **1.5** | **5** | **10** |
| 90% - Max Plume | 1.5 | 2.2 | 3 | 2.8 |
| 80% - Max Plume | 1 | 1.5 | 2.1 | 1.9 |
| 70% - Max Plume | 0.8 | 1.1 | 1.6 | 1.5 |
| 60% - Max Plume | 0.6 | 0.9 | 1.2 | 1.2 |
| 50% - Nominal | 0.5 | 0.7 | 1 | 0.9 |
| 60% - Min Plume | 0.4 | 0.6 | 0.8 | 0.8 |
| 70% - Min Plume | 0.3 | 0.4 | 0.6 | 0.6 |
| 80% - Min Plume | 0.2 | 0.3 | 0.5 | 0.5 |
| 90% - Min Plume | 0.2 | 0.2 | 0.3 | 0.3 |
| **Average** | 0.65 | 0.94 | 1.61 | 2.05 |

The effects of anisotropy on the model can be visualized with the following cross-sections. As shown below, the higher the anisotropy is set, the more connection is seen between horizontal points and the less connection between vertical points.

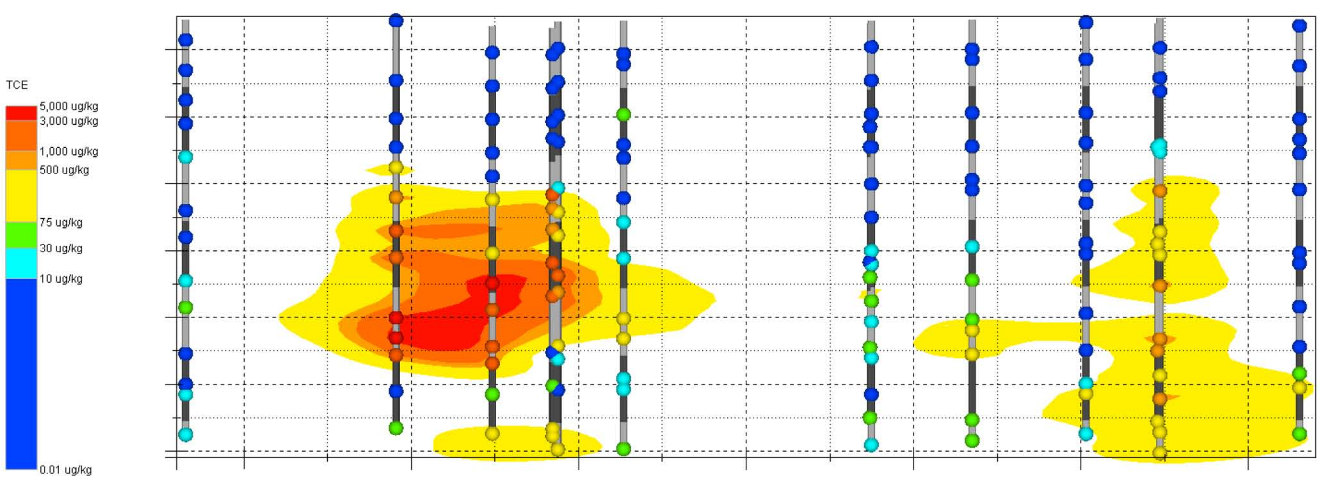





Anisotropy = 1.5




Anisotropy = 5




Anisotropy = 10

### C.1.4 CONCLUSIONS

The volume of TCE in soil is sensitive to the anisotropy used to interpolate the data as well as the statistical confidence bounds placed on the interpolation. A range of TCE volumes, from 0.2 to 2.2 gal, has been estimated by using kriging using various anisotropies and confidence levels. These volumes estimates do not vary by more than one order of magnitude from the nominal estimate under isotropic conditions of 0.7 gal. Given these sensitivity analyses, the 0.7 gal value represents a reasonable nominal value based upon the review of the data, interpolation results, and professional judgment.

## C.2. SWMU 211-B TCE VOLUME ESTIMATE AND SENSITIVITY ANALYSIS OF ANISOTROPY, MEASURES OF STATISTICAL CONFIDENCE USING HISTORIC (1998 AND 2004) UPPER CONTINENTAL RECHARGE SYSTEM (UCRS) SOIL INVESTIGATION AND 2012 REMEDIAL DESIGN SUPPORT INVESTIGATION (RDSI) DATASETS

### C.2.1 PURPOSE

Utilizing the soil sampling data results provided by LATA Kentucky, Geosyntec has developed estimates of the mass of TCE in soils above the RGA at SWMU 211-B, using C Tech’s EVS. Provided soil sampling data was collected during evaluation of the UCRS (1998 and 2004) and RDSI (2012) sampling from October 2012. The purpose of this calculation package is to evaluate the sensitivity of TCE mass estimates when interpolating the data using a kriging algorithm by varying the anisotropy of the model and evaluating the statistical confidence of the interpolation.

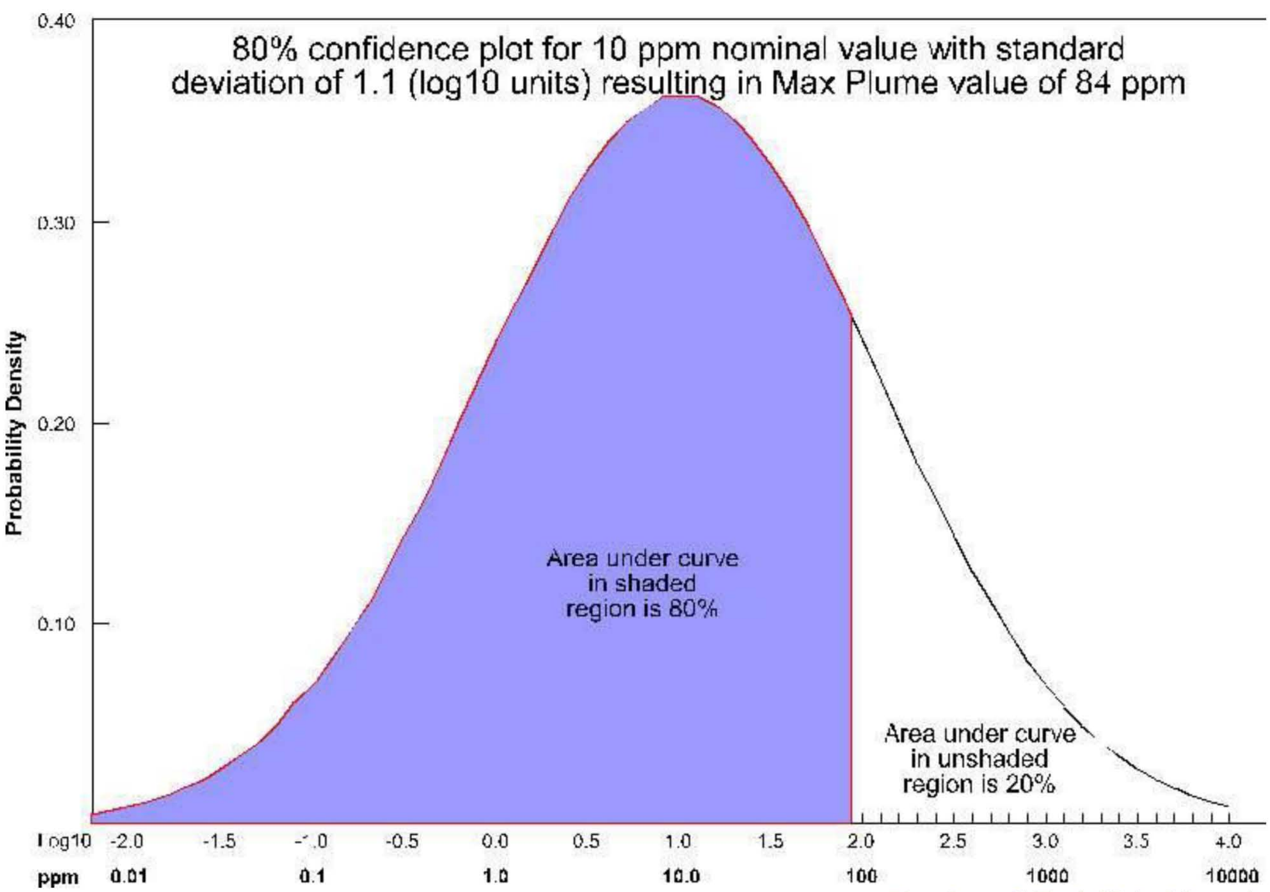
### C.2.2 METHODS

Soil sampling results were interpolated in EVS in order to estimate the volume of TCE in soils. A sensitivity analysis was performed to evaluate the volume of TCE under several different anisotropy levels: 1, 1.5, 5, and 10. EVS allows for further evaluation of the statistical confidence of the interpolation by providing results at differing user-defined confidence levels. Data were evaluated at 50, 60, 70, 80, and 90% confidence intervals, the results of which are provided in the calculation packages in Appendix C. A site-specific soil density of 1.4 gm/cc was used to calculate TCE mass and volume.

Anisotropy allows the model to consider the effects of anisotropy in the conductivity of soil matrices to fluid flow. In most cases, geologic materials are deposited with platy clay minerals oriented horizontally; thus, flow of water in both the saturated and unsaturated zone can be slower in the vertical direction than in the horizontal direction. Ore deposition also can occur along horizontal or vertical fault or fracture systems. Chemical constituents being transported with flowing fluids, therefore, may show a larger degree of spreading in one or the other direction. The Horiz./Vert. Anisotropy Ratio allows the kriging algorithm to specify a factor to be used to apply biased weighting on data points in horizontal and vertical directions away from a given model node. The default value for fluid flow is 10, which allows data points in a horizontal direction away from a model node to influence the kriged value at that node by a factor of 10 than data points an equal distance away in a vertical direction. A value of 10 typically would be appropriate for dissolved-phase concentrations in an aquifer that is either high-velocity or anisotropic. When the property being modeled is not related to fluid flow or other processes that might be affected by matrix anisotropy, then the recommended value is 1 (i.e., isotropic). Based on observations of data from soil sampling to date in SWMU 211-B, despite the fluid based nature of the release, it is expected that transport is vertically controlled more than horizontally controlled. Therefore the use of a lower anisotropy value is appropriate. Based upon the shape and connectedness of the plume to various sample points, an anisotropy constant of 1.5 was selected.

EVS can be used to determine the Min and Max Plume, or in this specific case, source area, using a Min-Max algorithm. The Min Plume calculates the minimum estimated size of the source area at a user-specified confidence level. Conversely, the Max Plume calculates the maximum estimated size of the source area at a user-specified confidence level. To determine the confidence level of the interpolation, EVS first calculates the nominal value and associated standard deviation at every node in the model. For the case of Max Plume and 80% confidence, at each node, a maximum value is determined such that 80% of the time, the actual values will fall below the maximum value (for that nominal concentration and standard deviation). This process is shown below as an example directly from the C Tech Help Manual for the case of an assumed nominal value of 10 ppm with a standard deviation of 1.1 (log units). For this case, the maximum value at that node would be approximately 84 ppm. This process is repeated for every node in the model.

For the plot shown below (from the C Tech Help Manual), the entire left portion of the bell curve is shaded. If assessing the minimum value, it would be the right side.




Plot from C Tech Help Manual

EVS allows the model to be gridded using several different techniques including convex hull (the default method) and rectilinear gridding. The convex hull of a set of points in two-dimensional space is the smallest convex area containing the set. In the x-y plane, the convex hull can be visualized as the shape assumed by a rubber band that has been stretched around the set and released to conform as closely as possible to it. EVS grids convex hull regions with quadrilaterals. Smoothing techniques are used to create a grid that has reasonably equal area cells. In rectilinear (a.k.a. uniform) gridding, the grid axes are parallel to the coordinate axes and the cells are always rectangular in cross-section. The positions of all the nodes can be computed knowing only the coordinate extents of the grid (minimum and maximum x, y, and z). In both convex hull and rectilinear gridding, adaptive gridding was used. Adaptive gridding is the localized refinement of a grid to provide higher resolution in the areas or volumes surrounding measured sample data.

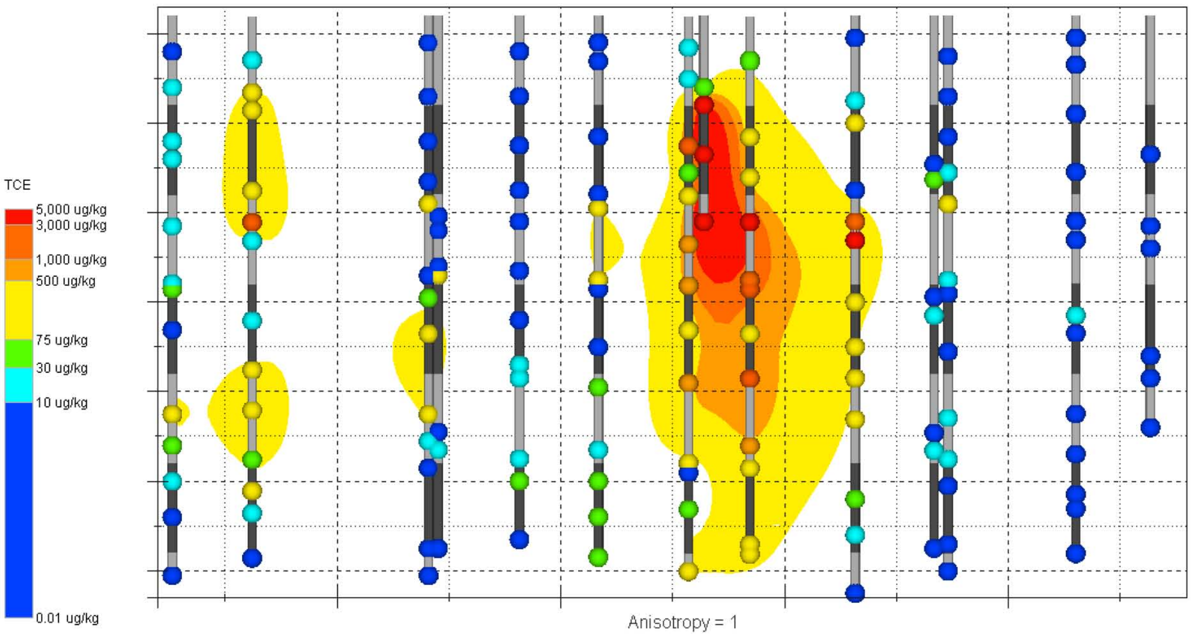
### C.2.3 RESULTS

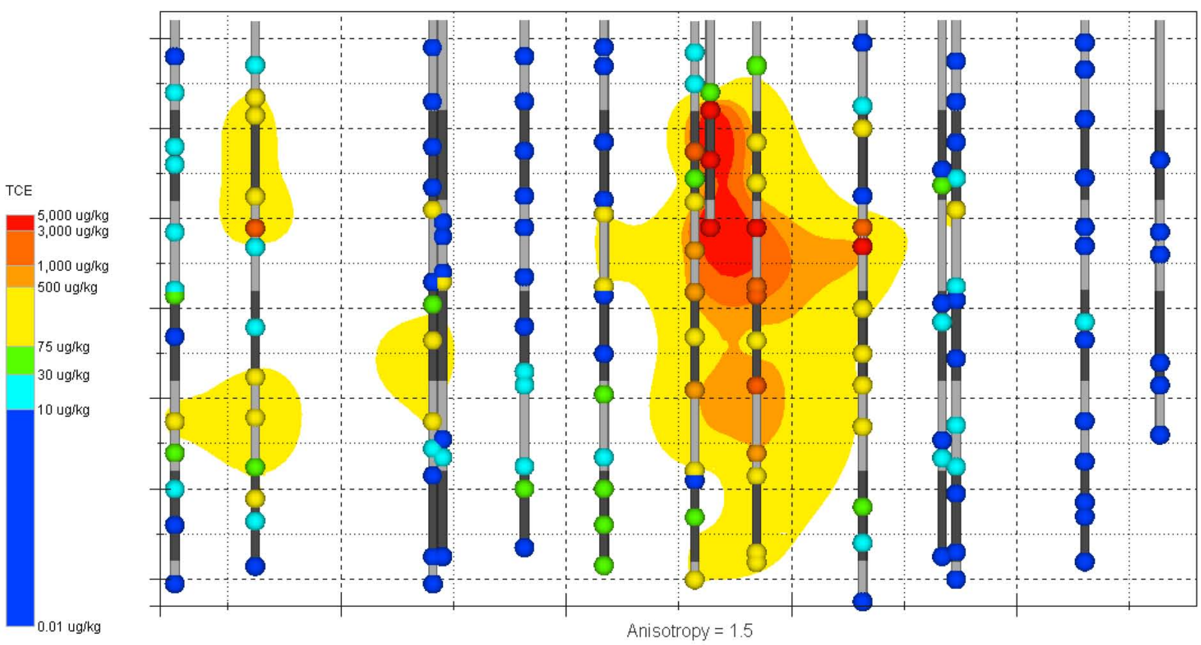
The table below provides the results of the volume estimates in gallons (gal) using the different datasets. The blue shading highlights the 50% nominal source volume estimate and the green shading highlights the results using an anisotropy value of one, which has previously been reported.

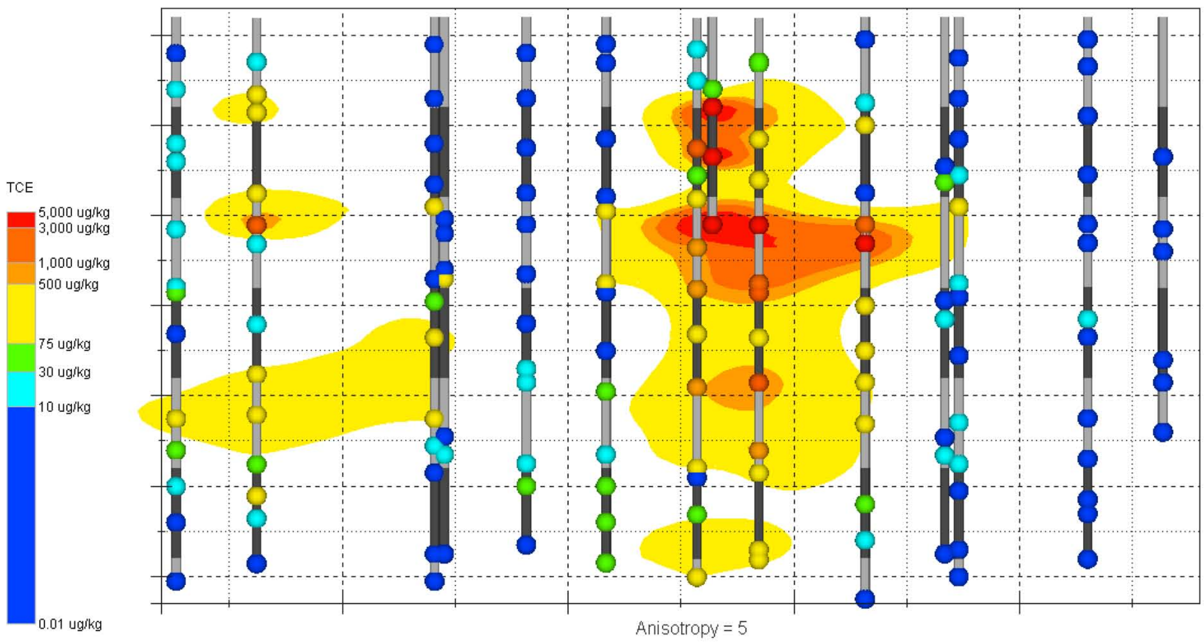
**Estimated Volume of TCE (gal) above 75 ug/kg in SWMU 211-B Soils**

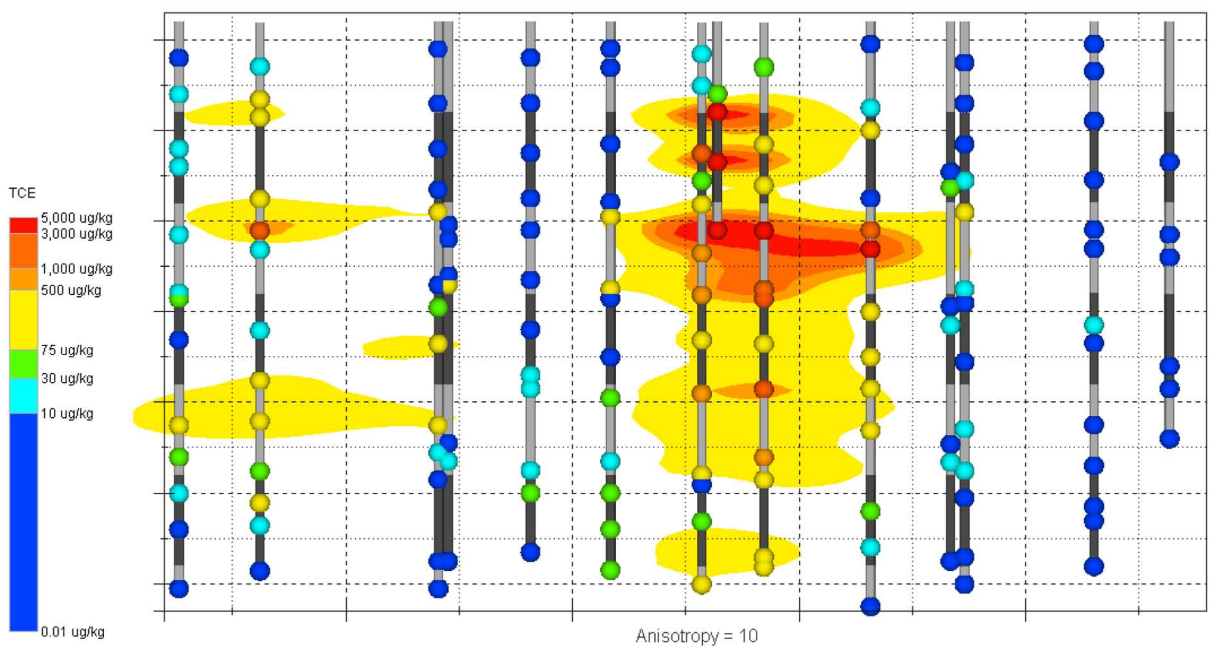
| | **Anisotropy** | | | |
|---|---|---|---|---|
| **Confidence Level** | 1 | 1.5 | 5 | 10 |
| 90% - Max Plume | 0.8 | 0.8 | 1.1 | 1 |
| 80% - Max Plume | 0.5 | 0.6 | 0.8 | 0.7 |
| 70% - Max Plume | 0.4 | 0.4 | 0.6 | 0.6 |
| 60% - Max Plume | 0.3 | 0.3 | 0.5 | 0.5 |
| 50% - Nominal | 0.3 | 0.3 | 0.4 | 0.4 |
| 60% - Min Plume | 0.2 | 0.2 | 0.3 | 0.3 |
| 70% - Min Plume | 0.2 | 0.2 | 0.3 | 0.3 |
| 80% - Min Plume | 0.1 | 0.1 | 0.2 | 0.2 |
| 90% - Min Plume | 0.1 | 0.1 | 0.1 | 0.2 |
| **Average** | 0.39 | 0.45 | 0.93 | 1.42 |

The effects of anisotropy on the model can be visualized with the following cross-sections. As shown below, the higher the anisotropy is set, the more connection is seen between horizontal points and the less connection between vertical points.


TCE
5,000 ug/kg
3,000 ug/kg
1,000 ug/kg
500 ug/kg
75 ug/kg
30 ug/kg
10 ug/kg
0.01 ug/kg
Anisotropy = 1


TCE
5,000 ug/kg
3,000 ug/kg
1,000 ug/kg
500 ug/kg
75 ug/kg
30 ug/kg
10 ug/kg
0.01 ug/kg
Anisotropy = 1.5




## C.2.4 CONCLUSIONS

The volume of TCE in soil is sensitive to the anisotropy used to interpolate the data as well as the statistical confidence bounds placed on the interpolation. A range of TCE volumes, from 0.1 to 1.1 gal, has been estimated by using kriging using various anisotropies and confidence levels. These volumes estimates do not vary by more than an order of magnitude from the nominal estimate under isotropic conditions of 0.3 gal. Given these sensitivity analyses, the 0.3 gal value represents a reasonable nominal value based upon the review of the data, interpolation results, and professional judgment.

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# APPENDIX D

# SOIL LITHOLOGY LOGS

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**211-A-001**

Plant North -2023.211, Plant East -5059.551 8/29/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.7 | Gravel with Silt, 10YR6/4 (light yellowish brown), loose, and dry. Gravel is subangular limestone, 0.2- to 0.8-inch diameter (dense gravel aggregate/DGA) | | Fill |
| 2.7 | 3.5 | Silt, 10YR8/2 (very pale brown) with some 10YR7/8 (yellow) mottling, moderately hard, nonplastic, and dry | | HU1 |
| 3.5 | 14.4 | Silt, 10YR7/3 (very pale brown), with some 10YR7/6 (yellow) mottling, soft, moderately plastic, and moist | | |
| 14.4 | 16.1 | Silt, 10YR7/4 (very pale brown), moderately soft, nonplastic, and moist | | |
| 16.1 | 19.5 | Silt, 10YR7/4 (very pale brown), with 10YR8/1 (white) mottling, soft, slightly plastic, and moist. Little gravel (rounded chert with iron patina, 0.3-inch diameter) beginning at 17.8 ft | | |
| 19.5 | 20.0 | Silty Gravel with little Clay, 10YR6/6 (brownish yellow), dense, and moist. Gravel is subangular to subrounded chert with iron patina, 0.2- to 0.5-inch diameter | | HU2 |
| 20.0 | 22.5 | No Recovery | | |
| 22.5 | 23.2 | Gravelly Silt, 10YR8/1 (white), moderately hard, nonplastic, and moist. Gravel is subrounded chert with and without iron patina, 0.2- to 0.4-inch diameter | | |
| 23.2 | 24.9 | Sand, 10YR6/6 (brownish yellow), loose, and moist. Sand is fine to medium, rounded, quartz grains | | |
| 24.9 | 26.0 | Silty Gravel, 10YR7/3 (very pale brown), dense, and moist. Gravel is subrounded chert with and without iron patina, 0.2- to 1.0-inch diameter | | |
| 26.0 | 29.5 | Silt with little Gravel, 10YR7/1 (light gray) with frequent 10YR7/4 (very pale brown) staining, moderately soft, moderately plastic, and moist. Gravel is rounded chert without iron patina, 0.3-iinch diameter | | |
| 29.5 | 30.1 | Silt, 10YR7/4 (very pale brown), moderately hard, moderately plastic, and moist | | |
| 30.1 | 31.0 | Silt, 10YR7/1 (light gray) with 10YR7/6 (yellow) mottling, moderately hard, slightly plastic, and moist | | |
| 31.0 | 32.2 | Silty Sand, 10YR7/4 (very pale brown), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 32.2 | 33.5 | Silt with Gravel, 10YR7/6 (yellow), moderately hard, slightly plastic, and moist | | |
| 33.5 | 34.7 | Silt, 10YR6/4 (light yellowish brown), soft, slightly plastic, and moist | | |

**211-A-001**

Plant North -2023.211, Plant East -5059.551 8/29/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 34.7 | 35.5 | Sand with Gravel, 10YR8/2 (very pale brown) with some 10YR6/4 (light yellowish brown) mottling, loose, and moist. Sand is very fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 0.2-inch diameter | | |
| 35.5 | 36.1 | Silt, 10YR8/1 (white), soft, moderately plastic, and moist | | HU3 |
| 36.1 | 37.3 | Silt with Sand, 7.5YR6/6 (reddish yellow) with some 7.5YR8/1 (white) mottling, moderately soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 37.3 | 37.9 | Silty Clay, 7.5YR7/1 (light gray), moderately hard, plastic, and moist | | |
| 37.9 | 44.0 | Silt, 10YR7/4 (very pale brown) mottled with 10YR8/2 (very pale brown), moderately soft, slightly plastic, and moist | | |
| 44.0 | 50.0 | Clayey Silt, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) mottling, moderately hard, plastic, and moist | | |
| 50.0 | 51.8 | Silt, 7.5YR7/1 (light gray) with little 7.5YR7/6 (reddish yellow) mottling, soft to very soft, moderately plastic, and wet | | |
| 51.8 | 52.2 | Silt with Gravel, 7.5YR7/1 (light gray) with little 7.5YR7/6 (reddish yellow) mottling, soft to very soft, moderately plastic, and wet. Gravel is rounded chert without iron patina, 0.1- to 0.2-inch diameter | | |
| 52.2 | 52.6 | Sand, 10YR8/1 (white), loose, and moist. Sand is fine quartz grains | | |
| 52.6 | 57.8 | Silt, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) mottling GRADING DOWN to 7.5YR7/4 (pink) with little 7.5YR8/1 (white) mottling, soft, moderately plastic, and moist | | |
| 57.8 | 59.7 | Sand, 10YR8/1 (white) with some 10YR3/1 (very dark gray) staining (manganese?), loose, and very moist. Sand is fine quartz grains | | HU4 |
| 59.7 | 60.0 | Sandy Gravel, 10YR6/6 (brownish yellow), loose, and moist. Gravel is chert with iron patina, subrounded to subangular, 0.2- to 1.0-inch diameter. Sand is fine quartz grains | | HU5 |

**211-A-002**

Plant North -2023.779, Plant East -5031.236 8/30/12 - 8/31/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.8 | Silt with Gravel, 10YR7/2 (light gray), moderately hard, nonplastic, and dry. Gravel is subangular limestone, 0.3- to 1.0-inch diameter (dense gravel aggregate/DGA) | | FILL |
| 1.8 | 3.8 | Silt, 10YR8/1 (white) with little 10YR8/8 (yellow) mottling, moderately hard, nonplastic, and dry | | HU1 |
| 3.8 | 13.9 | Silt, 10YR7/2 (light gray) with variable mottling/staining by 10YR6/6 (brownish yellow), soft, nonplastic, and moist | | |
| 13.9 | 16.2 | Silt, 10YR7/6 (yellow), moderately hard, nonplastic, and moist | | |
| 16.2 | 17.4 | Silt, 10YR7/1 (light gray), very soft, nonplastic, and moist | | |
| 17.4 | 20.0 | Silt with trace Gravel, 10YR7/4 (very pale brown) mottled with 10YR7/1 (light gray), moderately soft, slightly plastic, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3-inch diameter | | |
| 20.0 | 20.5 | Clay, 10YR6/2 (light brownish gray), moderately hard, plastic, and moist | | |
| 20.5 | 21.7 | Sandy Silt, 10YR6/6 (brownish yellow), with blebs of clay, 10YR6/2 (light brownish gray); moderately hard, slightly plastic, and moist. Sand is very fine quartz grains. | | |
| 21.7 | 21.9 | Gravel, 10YR6/6 (brownish yellow). Gravel is rounded to subrounded chert with iron patina, 0.3- to 0.8-inch diameter | | HU2 |
| 21.9 | 22.7 | Silty Clay with some Gravel, 10YR7/2 (light gray), moderately hard, plastic, and moist. Gravel is rounded chert with iron patina, approximately 0.5-inch diameter | | |
| 22.7 | 25.0 | Silty Sandy Gravel, 7.5YR6/6 (reddish yellow), hard, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.6-inch diameter. Sand is very fine quartz grains | | |
| 25.0 | 26.8 | Gravelly Sand, 10YR5/6 (yellowish brown), loose, and moist. Sand is fine quartz grains. Gravel is rounded chert with iron patina, 0.2- to 0.3-inch diameter | | |
| 26.8 | 30.7 | Silt, 10YR7/1 (light gray) with 10YR7/6 (yellow) mottling and micro-laminations, moderately plastic, soft, and moist | | |
| 30.7 | 31.3 | Silt with some Gravel, 10YR7/1 (light gray) with 10YR7/6 (yellow) mottling and micro-laminations, moderately plastic, soft, and moist. Gravel is subrounded chert with iron patina, 4 mm- to 0.7-inch diameter | | |
| 31.3 | 31.8 | Silt, 10YR8/4 (very pale brown) GRADING DOWN to 10YR8/1 (white), soft, slightly plastic, and moist | | |

**211-A-002**

Plant North -2023.779, Plant East -5031.236 8/30/12 - 8/31/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 31.8 | 32.5 | Sand with Gravel, 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is rounded chert with iron patina, 0.2- to 1.0-inch diameter | | |
| 32.5 | 35.0 | No recovery | | NO RECOVERY |
| 35.0 | 39.0 | Silty Clay, 7.5YR8/1 (white) with abundant 7.5YR7/6 (reddish yellow) mottling and staining GRADING DOWN to little mottling and staining, moderately soft, plastic, and moist | | HU3 |
| 39.0 | 40.5 | Silt, 10YR8/2 (very pale brown) mottled with 10YR6/2 (light yellowish brown) and 10YR7/6 (yellow), soft, slightly plastic, and moist | | |
| 40.5 | 43.3 | Interlensing Silty Clay and Silt, 10YR8/1 (white) with heavy mottling by 10YR6/6 (brownish yellow) and some 2.5YR7/8 (light red), moderately soft, moderately plastic, and moist | | |
| 43.3 | 49.6 | Silty Clay, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), moderately hard, moderately plastic, and moist | | |
| 49.6 | 52.9 | Silt with little Clay and Sand, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) mottling, soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 52.9 | 56.1 | Silty Clay, 7.5YR8/1 (white) with abundant small mottles of 7.5YR7/6 (reddish yellow), moderately hard, moderately plastic, and moist | | |
| 56.1 | 58.2 | Silt, 7.5YR6/6 (reddish yellow), moderately hard, slightly plastic, and moist | | |
| 58.2 | 60.0 | Sand with some blebs of Silt, 10YR8/1 (white) with some 10YR7/6 (yellow) mottling and some small blebs of 10YR3/1 (very dark gray) (manganese?), lightly consolidated, and very moist. Sand is very fine quartz grains | | HU4 |
| 60.0 | 60.4 | Sand, 10YR8/1 (white) with few 10YR7/6 (yellow) laminations, lightly consolidated, and wet. Sand is fine quartz grains | | |
| 60.4 | 60.9 | Gravelly Sand, 10YR8/2 (very pale brown), loose, and wet. Sand distribution is bimodal: 70% fine quartz grains and 30% coarse to very coarse, subrounded to rounded, chert grains (with and without iron patina). Gravel is rounded to subrounded chert with iron patina, 4 mm- to 0.8-inch diameter | | |
| 60.9 | 62.5 | Sandy Gravel, 10YR6/4 (light yellowish brown), loose, and wet. Gravel is rounded to subrounded chert with iron patina, 0.2- to 0.8-inch diameter. Sand distribution is bimodal, 65% fine to medium quartz grains and 35% coarse, subangular, chert grains | | HU5 |

**211-A-003**

Plant North -2022.639, Plant East -4994.843 9/12/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.2 | Silt, 10YR6/1 (gray), loose, and dry. Humic material and root zone | | Fill |
| 0.2 | 0.5 | Gravelly Silt, 10YR7/1 (light gray), loose (powder), nonplastic, and dry. Gravel is subangular to rounded chert, 0.2- to 1.0-inch diameter | | |
| 0.5 | 2.2 | Silt with some Gravel, 10YR7/4 (very pale brown), moderately hard, nonplastic, and slightly moist | | |
| 2.2 | 3.2 | Silt, 10YR8/1 (white) with little 10YR7/6 (yellow) mottling, hard, nonplastic, and slightly moist | | HU1 |
| 3.2 | 16.4 | Silt, 10YR8/2 (very pale brown) with variable mottling by 10YR6/6 (brownish yellow), soft, nonplastic, and moist | | |
| 16.4 | 20.1 | Slightly Clayey Silt, 10YR6/4 (light yellowish brown) with 10YR6/1 (gray) mottling, moderately hard, nonplastic, and slightly moist | | |
| 20.1 | 24.0 | Silty Sand with Gravel, 7.5YR6/6 (reddish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with light iron patina, 4 mm- to 0.4-inch diameter | | HU2 |
| 24.0 | 25.0 | Silt with little Gravel, 10YR8/2 (very pale brown), soft, slightly plastic, and moist. Gravel is subrounded chert without iron patina, 0.2- to 0.4-inch diameter | | |
| 25.0 | 25.5 | Sand with some Gravel, 10YR7/4 (very pale brown), lightly consolidated, and moist. Sand is 70% fine quartz grains and 30% coarse, rounded, chert grains. Gravel is subangular chert with iron patina, 0.4-inch diameter | | |
| 25.5 | 26.3 | Sand, 5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 26.3 | 28.2 | Silty Sand with Gravel as 20.1 to 24.0 ft | | |
| 28.2 | 30.0 | Silty Sand, 10YR8/1 (white) mottled with 10YR7/6 (yellow), firm/moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 30.0 | 36.1 | Silty Gravelly Sand, 7.5YR6/5 (reddish yellow), firm to soft, nonplastic, and moist to very moist. Sand size ranges from fine to coarse grains. Gravel is subangular chert, 0.5- to 1.2-inch diameter | | |
| 36.1 | 39.2 | Sandy Silt, 7.5YR6/8 (reddish yellow) with some mottling by 7.5YR6/1 (gray), soft to very soft, plastic, and very moist | | |
| 39.2 | 40.0 | Silt, 7.5YR7/3 (pink) with 7.5YR8/1 (white) banding, stiff to firm, and slightly moist | | |
| 40.0 | 40.9 | Clay with little Silt, 7.5YR6/8 (reddish yellow) mottled with 10YR7/1 (light gray), very stiff to stiff, nonplastic, and slightly moist | | |

**211-A-003**

Plant North -2022.639, Plant East -4994.843 9/12/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 40.9 | 42.9 | Sandy Silt, 7.5YR7/6 (reddish brown) with 10YR7/1 (gray) and 7.5YR5/8 (strong brown) mottling, stiff to firm, and slightly moist | | HU3 |
| 42.9 | 45.0 | Sandy Silt, 7.5YR6/8 (reddish yellow) with some 10YR7/1 (light gray) mottling, very firm to firm, and slightly moist. Sand is very fine quartz grains | | |
| 45.0 | 48.4 | Clayey Sandy Silt, 7.5YR7/8 (reddish yellow) with slight mottling by 10YR7/1 (light gray) in sections and some 7.5YR5/8 (strong brown) speckling throughout, very firm, nonplastic, and slightly moist | | |
| 48.4 | 49.8 | Clayey Silt with very little Sand, 10YR7/1 (light gray) with some 7.5YR6/8 (reddish yellow) mottling, firm, and slightly moist. Sand is very fine quartz grains | | |
| 49.8 | 51.9 | Silty Sand, 10YR7/6 (yellow), firm, and slightly moist. Sand is very fine quartz grains | | |
| 51.9 | 52.5 | Silty Sand, 10YR7/1 (light gray), firm to very firm, and slightly moist. Sand is mostly very fine quartz grains but with trace of coarse, white, chert grains | | |
| 52.5 | 54.0 | Silty Sand, 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 54.0 | 55.0 | Sandy Silty Clay, 10YR7/1 (light gray) mottled with 7.5YR6/8 (reddish yellow), firm to stiff, and slightly moist | | |
| 55.0 | 55.2 | Sand, 7.5YR6/8 (reddish yellow), slightly loose, and moist. Sand is very fine to fine quartz grains | | |
| 55.2 | 58.2 | Clay, 10YR8/1 (white) mottled with 7.5YR5/6 (strong brown), stiff to very stiff, and slightly moist | | |
| 58.2 | 59.7 | Silty Sand, 7.5YR6/8 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 59.7 | 61.0 | Sand, 10YR8/1 (white), loose, and wet/saturated | | HU4 |
| 61.0 | 61.3 | Sand with Gravel, 10YR8/1 (white), loose, and wet/saturated | | |
| 61.3 | 62.5 | Gravelly Silty Sand, 7.5YR6/8 (reddish yellow), very firm, and moist. Gravel is subangular to subrounded chert with iron patina, 0.5- to 1.2-inch diameter | | |

**211-A-004**

Plant North -2048.082, Plant East -5212.811 9/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.6 | Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | Fill |
| 3.6 | 7.5 | Silt, 10YR7/1 (light gray) with some 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | HU1 |
| 7.5 | 10.0 | Permeameter sample - no description | | |
| 10.0 | 12.5 | Silt as 3.6 to 7.5 ft | | |
| 12.5 | 13.5 | Sand, 10YR8/4 (very pale brown), dense, and moist. Sand is very fine quartz grains | | |
| 13.5 | 14.7 | Silt, 10YR7/4 (very pale brown), soft, slightly plastic, and moist | | |
| 14.7 | 15.0 | Silt with little Gravel and little Clay, 10YR7/2 (light gray) mottled with 7.5YR6/6 (reddish yellow), moderately hard, slightly to moderately plastic, and moist. Gravel is subangular chert without iron patina, 0.3-inch diameter | | |
| 15.0 | 15.5 | Silt, 10YR7/2 (light gray), very soft, nonplastic, and moist. Slough | | |
| 15.5 | 17.2 | Silt with little Clay and little Gravel, 7.5YR7/2 (pinkish gray) with 7.5YR7/6 (reddish yellow) staining, moderately hard, moderately plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 1.0-inch diameter | | |
| 17.2 | 17.5 | Sand with Gravel, 7.5YR7/4 (pink), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.4- to 0.6-inch diameter | | |
| 17.5 | 20.0 | Permeameter sample - no description | | |
| 20.0 | 21.1 | Silt with little Clay and little Gravel as 15.5 to 17.2 ft | | |
| 21.1 | 23.8 | Sand with Gravel, 7.5YR7/4 (pink), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 0.3- to 0.5-inch diameter | | HU2 |
| 23.8 | 24.2 | Sand, 7.5YR7/4 (pink), firm, and moist. Sand is fine to medium quartz grains | | |
| 24.2 | 24.6 | Silt with some Gravel, 10YR7/1 (light gray) with 7.5YR7/6 (reddish yellow) staining, soft, plastic, and moist. Gravel is subrounded chert without(?) iron patina, 1.0-inch diameter | | |
| 24.6 | 26.0 | Sand, 10YR8/2 (very pale brown) GRADING DOWN to 10YR8/4 (very pale brown), dense, and moist. Sand is fine quartz grains | | |
| 26.0 | 26.5 | Gravelly Sand with Silt, 10YR7/6 (yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.6-inch diameter | | |
| 26.5 | 28.5 | Silt with Sand, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is fine quartz grains | | |

**211-A-004**

Plant North -2048.082, Plant East -5212.811 9/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 28.5 | 30.0 | Sand with Gravel, 10YR8/3 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 4 mm- to 0.6-inch diameter | | |
| 30.0 | 31.9 | Sand with Gravel and some Silt, 7.5YR6/6 (reddish yellow). Sand is 80% fine to medium quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert without (?) iron patina, 4 mm- to 0.5-inch diameter | | |
| 31.9 | 32.7 | Silt with Clay, 7.5YR6/6 (reddish yellow), moderately soft, plastic, and moist | | HU3 |
| 32.7 | 42.4 | Silt, 7.5YR6/6 (reddish yellow) GRADING DOWN to 10YR7/6 (yellow) and then to 10YR8/3 (very pale brown) (over 41.0 to 42.4 ft), soft, slightly plastic, and moist | | |
| 42.4 | 50.0 | Silt with little Clay, 7.5YR8/4 (pink) with some 7.5YR7/6 (reddish yellow) mottling, moderately soft, plastic, and moist | | |
| 50.0 | 52.1 | Silt with Sand, 10YR8/1 (white) with 10YR8/6 (yellow) laminations, soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 52.1 | 54.6 | Silt with Sand, 5YR8/2 (pinkish white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 54.6 | 55.4 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is very fine to fine quartz grains | | |
| 55.4 | 56.8 | Silt with Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 56.8 | 57.5 | Silt with some Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white), moderately hard, slightly plastic, and moist | | |
| 57.5 | 61.0 | Silt with Sand, 7.5YR8/1 (white) mottled with 5YR6/6 (reddish yellow), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 61.0 | 64.6 | Sand, 10YR8/3 (very pale brown), loose, and wet. Sand is fine quartz grains | | HU4 |
| 64.6 | 65.0 | Sand with Gravel, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 1.0-inch diameter | | |

**211-A-005**

Plant North -2047.983, Plant East -5179.833 9/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.3 | Root zone and humic-rich soil, 10YR4/1 (dark gray) | | Fill |
| 0.3 | 0.8 | Silty Gravel (dense gravel aggregate/DGA), 10YR7/1 (light gray), loose, and moist. Gravel is subangular to subrounded limestone, 4-mm to 0.3-inch diameter | | |
| 0.8 | 1.4 | Silt with Gravel (fill), 10YR7/3 (very pale brown), soft, nonplastic, and moist. Gravel is rounded chert with iron patina, 0.7- to 1.0-inch diameter | | |
| 1.4 | 2.5 | Silt with Gravel (fill) as 0.8 to 1.4 ft but interbedded 10YR5/1 (gray) and 10YR8/1 (white) | | |
| 2.5 | 15.2 | Silt, 10YR8/2 (very pale brown) with 10YR6/6 (brownish yellow) mottling and few 10YR4/1 (dark gray) laminations, soft, nonplastic, and moist | | HU1 |
| 15.2 | 16.5 | Sand, 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains | | HU2 |
| 16.5 | 18.7 | Sand with some Gravel, 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.5 to 0.8-inch diameter | | |
| 18.7 | 21.5 | Slightly Clayey Silt, 10YR7/1 (light gray) with some 10YR7/6 (yellow) mottling, moderately hard, slightly plastic, and moist | | |
| 21.5 | 23.5 | Gravel with Silt, 10YR7/1 (light gray) GRADING DOWN to 10YR5/6 (yellowish brown), hard, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.8-inch diameter | | |
| 23.5 | 27.5 | Sand with Gravel to Gravelly Sand, 10YR7/4 (very pale brown) with some 10YR8/1 (white) laminations, lightly consolidated and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.3- to 1.0-inch diameter | | |
| 27.5 | 35.2 | Gravelly Sand, 10YR8/3 (very pale brown) mottled with 10YR8/1 (white), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.2- to 0.8-inch diameter | | |
| 35.2 | 39.6 | Slightly Clayey Silt, 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, slightly-to-moderately plastic, and moist | | |
| 39.6 | 42.5 | Silty Sand, 7.5YR8/1 (white) heavily mottled with 7.5YR7/6 (reddish yellow), lightly consolidated/soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 42.5 | 48.4 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) with little 7.5YR8/1 (white) mottling, moderately soft, moderately plastic, and moist | | |

**211-A-005**

Plant North -2047.983, Plant East -5179.833 9/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 48.4 | 49.9 | Silt with Sand, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), soft, slightly plastic, and moist | | HU3 |
| 49.9 | 52.3 | Sandy Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist | | |
| 52.3 | 53.4 | Sand with some Gravel, 7.5YR8/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is subangular chert with iron patina, 0.6-inch diameter | | |
| 53.4 | 53.8 | Sand, 10YR7/6 (yellow) GRADING DOWN to 10YR8/1 (white), loose and moist. Sand is predominately (70%) fine grained but includes (30%) coarse, rounded chert grains | | |
| 53.8 | 54.3 | Sandy Gravel with Silt, 10YR5/1 (gray) (stained with manganese?), loose, and very moist. Gravel is rounded chert with iron patina, 0.4- to 0.6-inch diameter. Sand is fine grained | | |
| 54.3 | 56.8 | Sand with Gravel, 7.5YR8/2 (pinkish white) with 7.5YR7/6 (reddish yellow) laminations, lightly consolidated, and moist. Sand is fine quartz grains. Gravel is rounded to subangular chert with iron patina, 0.2- to 0.4-inch diameter | | |
| 56.8 | 58.5 | Clay, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations GRADING DOWN to 2.5YR8/1 (white) with 2.5YR7/6 (light red) laminations, soft, plastic, and moist | | |
| 58.5 | 60.2 | Silt with Sand, 2.5YR8/1 (white) with 2.5YR7/6 (light red) laminations GRADING DOWNWARD to 10YR8/1 (white), soft, very slightly plastic, and moist. Sand is very fine quartz grains | | |
| 60.2 | 61.6 | Sand, 10YR8.1 (white) with 10YR7/6 (yellow) laminations, lightly consolidated, and very moist. Sand is fine quartz grains | | HU4 |
| 61.6 | 62.0 | Sandy Gravel, 10YR8/2 (very pale brown), loose, and very moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4-mm to 0.6-inch diameter | | HU5 |

**211-A-006**

Plant North -2043.464, Plant East -5148.427 9/26/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.4 | Silt, 10YR5/2 (grayish brown), soft (loose), nonplastic, and moist. Zone of roots and humic material | | Fill |
| 0.4 | 1.7 | Silt, 10YR6/3 (pale brown), soft, nonplastic, and moist. Note: some Gravel at 1.7 ft, subangular to subrounded chert with iron patina, 0.3- to 0.8-inch diameter | | |
| 1.7 | 16.0 | Silt, 10YR8/2 (very pale brown), mottled with 10YR7/6 (yellow), soft, nonplastic, and moist | | HU1 |
| 16.0 | 17.8 | Silt, 10YR8/1 (white) with frequent thin interbeds of Sand, 10YR7/6 (yellow). Silt is soft, nonplastic, and moist. Sand is very fine quartz grains, lightly consolidated, and moist | | |
| 17.8 | 18.9 | Sand, 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is very fine quartz grains | | HU2 |
| 18.9 | 19.8 | Slightly Clayey Silt, 10YR7/3 (very pale brown) with little 10YR7/6 (yellow) mottling, soft, plastic, and moist | | |
| 19.8 | 21.3 | Clayey Silt with some Gravel, 10YR7/2 (light gray), soft, plastic, and moist. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 21.3 | 25.0 | Silty Gravelly Sand, 7.5YR6/4 (light brown), dense, and moist. Sand consists of 70% fine quartz grains and 30% coarse to very coarse, subrounded, chert grains. Gravel is subangular to subrounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 25.0 | 30.0 | Silt, 10YR8/2 (very pale brown) mottled with 10YR8/6 (yellow), soft, moderately plastic, and moist | | |
| 30.0 | 32.3 | Silt with Sand, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 32.3 | 33.6 | Sand, 10YR8/2 (very pale brown), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 33.6 | 36.7 | Silty Sand with Gravel, 10YR7/4 (very pale brown), dense, and moist. Sand consists of 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded chert without iron patina, 0.4-inch diameter | | |
| 36.7 | 38.0 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) with 7.5YR8/1 (white) mottling, soft, plastic, and moist | | |
| 38.0 | 41.0 | Silt with Sand, 10YR8/2 (very pale brown), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 41.0 | 48.0 | Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |

**211-A-006**

Plant North -2043.464, Plant East -5148.427 9/26/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 48.0 | 49.0 | Silt with Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | HU3 |
| 49.0 | 54.1 | Sand, 7.5YR7/6 (reddish yellow) GRADING DOWN to 7.5YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 54.1 | 55.3 | Sand with Gravel, 10YR8/2 (very pale brown), loose, and moist. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 55.3 | 55.5 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | |
| 55.5 | 57.4 | Clay, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) laminations, moderately hard, plastic, and moist | | |
| 57.4 | 59.4 | Silt, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) laminations GRADING DOWN to massive 7.5YR8/1 (white), soft, moderately plastic, and moist | | |
| 59.4 | 61.2 | Sand, 10YR8/1 (white), loose, and wet. Sand is very fine quartz grains | | HU4 |
| 61.2 | 62.5 | Gravelly Sand, 10YR8/4 (very pale brown), loose, and wet. Sand is fine to medium, rounded, quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.7-inch diameter | | |

**211-A-008**

Plant North -2043.219, Plant East -5088.804 9/20/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.7 | Sand with Gravel to Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subrounded chert with iron patina, 0.3- to 0.50inch diameter | | Fill |
| 2.7 | 13.1 | Silt, 10YR7/1 (light gray) with some 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | HU1 |
| 13.1 | 14.8 | Interbedded Fine Sand, 7.5YR6/6 (reddish yellow), and Very Fine Sand, 7.5YR8/1 (white); firm, and moist | | HU2 |
| 14.8 | 17.0 | Gravelly Sand, 7.5YR5/6 (strong brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.6-inch diameter | | |
| 17.0 | 17.7 | Sand, 10YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains | | |
| 17.7 | 21.3 | Gravelly Sand as 14.8 to 17.0 ft | | |
| 21.3 | 21.7 | Sand with Gravel, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 21.7 | 22.3 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 22.3 | 26.0 | Silt, 10YR8/4 (very pale brown) mottled with 10YR8/1 (white), soft, plastic to moderately plastic, and moist | | |
| 26.0 | 27.1 | Sand with little Gravel, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 27.1 | 28.0 | Gravelly Sand, 10YR8/1 (white) mottled with 10YR8/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.4-inch diameter | | |
| 28.0 | 28.8 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 28.8 | 30.0 | Sandy Gravel, 10YR8/2 (very pale brown), dense, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 30.0 | 30.8 | Sandy Gravel as 28.8 to 30.0 ft but with Silt | | |
| 30.8 | 32.4 | Sandy Gravel as 28.8 to 30.0 ft | | |
| 32.4 | 37.0 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/2 (pinkish white), soft, plastic to moderately plastic, and moist | | |
| 37.0 | 40.8 | Silt with Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |
| 40.8 | 41.7 | Silt with Clay as 37.0 to 40.8 ft but very soft | | |

**211-A-008**

Plant North -2043.219, Plant East -5088.804 | 9/20/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 41.7 | 43.0 | Silt with Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 10YR8/2 (very pale brown), moderately hard, moderately plastic, and moist | | HU3 |
| 43.0 | 47.4 | Silt with Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately soft with blebs of moderately hard and blebs of soft, slightly to moderately plastic, and moist | | |
| 47.4 | 49.5 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains. Note: with subrounded chert gravel with iron patina, 0.3-inch diameter, at 49.2 to 49.5 ft | | |
| 49.5 | 55.1 | Silt with Clay, 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately hard, slightly plastic, and moist | | |
| 55.1 | 58.0 | Silt with Sand, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 10YR8/3 (very pale brown), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 58.0 | 58.5 | Sand, 10YR8/6 (yellow), firm, and moist. Sand is very fine quartz grains | | HU4 |
| 58.5 | 60.2 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 60.2 | 60.5 | Sand with Silt and Gravel, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.3-inch diameter | | |
| 60.5 | 62.0 | Sand with a few Silt interbeds, 10YR8/2 (very pale brown), lightly consolidated to firm, and moist. Sand is fine quartz grains | | |
| 62.0 | 62.1 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is subrounded chert with iron patina, 0.3-inch diameter. Sand is fine quartz grains | | HU5 |
| 62.1 | 62.5 | Sand with a few Silt interbeds as 60.5 to 62.0 ft | | |

**211-A-009**

Plant North -2043.587, Plant East -5058.315 9/20/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.2 | Silt, 10YR5/1 (gray), soft, nonplastic, and moist. Zone of roots and humic material | | |
| 0.2 | 1.2 | Silt, 10YR6/3 (pale brown), soft, nonplastic, and moist | | |
| 1.2 | 5.0 | Silt, 10YR7/1 (light gray), hard, nonplastic, and dry | | |
| 5.0 | 5.9 | Silt, 10YR7/1 (light gray), moderately hard, nonplastic, and moist | | |
| 5.9 | 17.5 | Silt, 10YR8/2 (very pale brown) with 10YR6/6 (brownish yellow) mottling, soft, slightly plastic, and moist | | HU1 |
| 17.5 | 20.2 | Silt with some Clay and Gravel, 10YR6/6 (brownish yellow) with 10YR8/2 (very pale brown) mottling, moderately soft, plastic, and moist. Gravel consists of subangular to subrounded chert without iron patina, 0.3- to 0.8-inch diameter | | |
| 20.2 | 21.1 | Silty Sand with Gravel, 7.5YR6/6 (reddish yellow), moderately dense, and moist. Sand consists of 70% fine quartz grains and 30% medium, rounded, quartz grains. Gravel consists of subangular to subrounded chert with iron patina, 0.3- to 0.4-inch diameter | | |
| 21.1 | 21.4 | Silt, 10YR7/1 (light gray), moderately soft, nonplastic, and moist | | |
| 21.4 | 22.6 | Silty Sand with some Gravel, 7.5YR5/6 (strong brown), moderately dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.4-inch diameter | | |
| 22.6 | 25.1 | Silt, 10YR8/2 (very pale brown) with little 10YR7/6 (yellow) mottling, moderately hard, slightly plastic, and moist | | |
| 25.1 | 25.5 | Sandy Gravel, 7.5YR6/6 (reddish yellow) | | HU2 |
| 25.5 | 28.0 | Silt with trace of Gravel, 7.5YR7/6 (reddish yellow) mottled with 7.5YR7/1 (light gray), soft, slightly plastic, and moist. Gravel is rounded chert with iron patina, 1.0-inch diameter | | |
| 28.0 | 33.0 | Silt with little Gravel, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) mottling GRADING DOWN to 10YR7/3 (very pale brown), soft, nonplastic, and moist. Gravel is rounded chert without iron patina, 0.4- to 0.8-inch diameter | | |
| 33.0 | 35.0 | Silty Sand with Gravel, 10YR6/6 (brownish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with and without iron patina, 0.2 - to 0.6-inch diameter | | |
| 35.0 | 37.8 | Slightly Clayey Silt, 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |
| 37.8 | 42.0 | Silt, 10YR7/2 (light gray) mottled with 10YR6/6 (yellow), soft, moderately plastic, and moist | | |

**211-A-009**

Plant North -2043.587, Plant East -5058.315 9/20/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 42.0 | 42.2 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | HU3 |
| 42.2 | 51.6 | Silty Clay, 7.5YR7/1 (light gray) mottled with 7.5YR6/6 (reddish yellow), moderately hard, moderately plastic, and moist | | |
| 51.6 | 52.7 | Sand with little Gravel, 10YR8/1 (white) GRADING DOWN to 10YR8/4 (very pale brown), firm, and moist. Sand is very fine to fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.4- to 0.5-inich diameter | | |
| 52.7 | 53.5 | Silty Clay as 42.2 to 51.6 ft | | |
| 53.5 | 54.7 | Silty Sand, 10YR8/3 (very pale brown) GRADING DOWN to 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 54.7 | 58.8 | Silt with some Clay, 10YR7/6 (yellow) with mottling/laminations of 10YR8/1 (white), moderately hard, moderately plastic, and moist | | |
| 58.8 | 59.9 | Silt, 10YR8/4 (very pale brown) with 10YR7/6 (yellow) laminations, soft, slightly plastic, and moist | | |
| 59.9 | 61.8 | Sand, 10YR8/4 (very pale brown), loose, and wet. Sand is very fine quartz grains | | HU4 |
| 61.8 | 62.3 | Silt, 10YR8/2 (very pale brown), soft, moderately plastic, and moist | | |
| 62.3 | 62.5 | Sandy Gravel, 5YR5/3 (brown), loose, and wet. Gravel is subrounded to rounded chert with iron patina, 0.4- to 1.0-inch diameter. Sand is fine quartz grains | | HU5 |

**211-A-010**

Plant North -2045.429, Plant East -5030.721 9/13/2012 & 9/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.2 | Surface soil and pea gravel | | Fill |
| 1.2 | 5.0 | Silt, 10YR8/1 (white) with little 5YR6/8 (reddish yellow) mottling, and dry | | HU1 |
| 5.0 | 6.5 | Silt, 10YR8/1 (white) with traces of 5YR6/8 (reddish yellow), and dry to slightly moist | | |
| 6.5 | 10.0 | Silt, 10YR8/1 (white) mottled with 5YR6/8 (reddish yellow), slightly plastic, and moist to very moist | | |
| 10.0 | 11.2 | Silt, 10YR7/1 (light gray) mottled with 5YR6/8 (reddish yellow), firm, and moist | | |
| 11.2 | 12.0 | Silt, 10YR7/1 (light gray), soft, slightly plastic, and moist | | |
| 12.0 | 12.6 | Silt, 10YR7/1 (light gray), firm, slightly plastic, and moist | | |
| 12.6 | 13.7 | Silt, 7.5YR7/8 (reddish yellow) mottled with 10YR7/1 (light gray), firm, and slightly moist | | |
| 13.7 | 14.5 | Silt, 10YR6/1 (gray) with slight mottling by 7.5YR6/8 (reddish yellow), firm, and slightly moist | | |
| 14.5 | 15.0 | Silt with little Sand, 10YR8/4 (very pale brown), firm, and dry to slightly moist. Sand is very fine quartz grains | | |
| 15.0 | 15.6 | Sandy Silt, 10YR8/4 (very pale brown), firm, and slightly moist. Sand is very fine grained | | |
| 15.6 | 15.8 | Sandy Silt, 2.5YR5/6 (red), and slightly moist. Sand ranges from fine to coarse grained and subangular | | |
| 15.8 | 16.5 | Silt, 7.5YR6/8 (reddish yellow) mottled with 10YR7/1 (light gray), firm, and slightly moist | | |
| 16.5 | 17.4 | Clayey Silt, 7.5YR6/8 (reddish yellow) with slight 7.5YR7/1 (light gray) mottling, firm to stiff, and slightly moist | | |
| 17.4 | 20.0 | Clayey Silt, 10YR6/1 (gray) with some 2.5YR5/8 (red) mottling, firm, slightly plastic, and slightly moist | | |
| 20.0 | 20.6 | Gravel with some Sand, 7.5YR6/6 (reddish yellow), loose, and moist. Gravel is subrounded to subangular chert with iron patina, 4-mm to 0.4-inch diameter | | |
| 20.6 | 21.2 | Clay with Gravel, 7.5YR7/2 (pinkish gray), hard to moderately plastic, and slightly moist. Gravel is subrounded to rounded chert without iron patina, 0.4-inch diameter | | |
| 21.2 | 21.7 | Sandy Gravel, 7.5YR6/6 (reddish yellow), loose, and moist. Gravel is subrounded to subangular chert with iron patina, 4-mm to 0.4-inch diameter. Sand is fine grained | | |
| 21.7 | 22.2 | Silt, 10YR7/1 (light gray) with 10YR7/4 (very pale brown) mottling, soft, slightly plastic, and moist | | |

**211-A-010**

Plant North -2045.429, Plant East -5030.721 9/13/2012 & 9/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 22.2 | 23.7 | Sandy Gravel, 10YR7/4 (very pale brown), loose and moist. Gravel is subrounded to subangular chert with iron patina, 4-mm to 0.7-inch diameter. Sand consists of 60% fine grains and 40 % coarse, rounded, chert grains | | HU2 |
| 23.7 | 26.4 | Sand with Gravel, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with light iron patina, 0.3- to 0.8-inch diameter | | |
| 26.4 | 26.8 | Sand with little Gravel, 10YR8/2 (very pale brown) stained with 10YR7/4 (reddish yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with light iron patina, 0.3 to 0.4-inch diameter | | |
| 26.8 | 32.2 | Silt with Sand, 10YR8/1 (very pale brown) mottled with 10YR7/6 (yellow), moderately soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 32.2 | 33.9 | Sandy Gravel, 7.5YR6/6 (reddish yellow), dense, and moist. Gravel is subangular to subrounded chert without iron patina, 0.3- to 0.8-inch diameter. Sand is fine grained | | |
| 33.9 | 34.1 | Sand, 10YR8/1 (white), lightly consolidated, and moist. Sand is fine quartz grains | | |
| 34.1 | 34.6 | Sandy Gravel, 10YR8/2 (very pale brown), lightly consolidated, and moist. Gravel is subangular chert with light iron patina, 0.2- to 0.4-inch diameter. Sand is fine grained | | |
| 34.6 | 36.3 | Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/3 (pink), soft, very plastic, and moist | | HU3 |
| 36.3 | 40.0 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) with 7.5YR8/1 (white) mottling, soft, moderately plastic, and moist | | |
| 40.0 | 42.4 | Silt with some Sand, 10YR8/2 (very pale brown) with frequent mottling by 10YR7/6 (yellow), moderately hard, nonplastic, and moist. Sand is fine quartz grains | | |
| 42.4 | 47.5 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately hard to hard, slightly plastic, and moist | | |
| 47.5 | 51.1 | Silt, 7.5YR8/1 (white) with some 7.5YR7/6 (reddish yellow) mottling, soft, moderately plastic, and moist | | |
| 51.1 | 51.9 | Silt as 47.5 to 51.1 with Gravel. Gravel is rounded chert without iron patina, 4-mm to 0.3-inch diameter | | |
| 51.9 | 52.1 | Gravelly Sand with "salt and pepper" texture - 10YR8/1 (white) and 10YR5/1 (gray) - loose, and moist. Sand consists of both fine grains and rounded coarse grains. Gravel is subrounded chert without iron patina, 4-mm to 0.5-inch diameter | | |

**211-A-010**

Plant North -2045.429, Plant East -5030.721 9/13/2012 & 9/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 52.1 | 55.0 | Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) mottling, moderately soft, nonplastic, and moist | | |
| 55.0 | 59.9 | Silt with minor interbeds of Silt with Sand, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), moderately hard, moderately plastic, and moist. Sand is fine quartz grains | | |
| 59.9 | 60.8 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | HU4 |
| 60.8 | 61.2 | Sand as 59.9 to 60.8 ft but with 7.5YR8/1 (white) and 7.5YR7/6 (reddish yellow) "beds" | | |
| 61.2 | 62.2 | Sand as 59.9 to 60.8 ft but colored 7.5YR8/4 (pink) | | |
| 62.2 | 62.5 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is subangular chert with iron patina, 4-mm to 0.8-inch diameter. Sand is fine grained | | HU5 |

**211-A-011**

Plant North -2048.2, Plant East -4995.49 8/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.2 | Soil - made land - limestone gravel | | FILL |
| 1.2 | 2.6 | Silt, 10YR7/3 (very pale brown) with some mottling by 10YR8/1 (white), loose to slightly firm, and dry to slightly moist | | HU1 |
| 2.6 | 6.0 | Silt, 10YR8/1 (white) with mottling by 10YR7/8 (yellow), slightly moist | | |
| 6.0 | 10.0 | Silt, 10YR7/1 (light gray) mottled and speckled with 10YR6/8 (brownish yellow), firm GRADING DOWN to soft, and slightly moist to moist | | |
| 10.0 | 12.4 | Silt, 10YR7/1 (light gray) mottled with 7.5YR6/8 (reddish yellow), soft, and slightly moist | | |
| 12.4 | 14.0 | Silt, 10YR7/2 (light gray) speckled with 10YR7/8 (yellow), firm, and slightly moist | | |
| 14.0 | 15.0 | Silt with little Clay, 10YR6/6 (brownish yellow) banded with 7.5YR6/6 (reddish yellow), firm, and slightly moist | | |
| 15.0 | 16.4 | Silt with very little Sand, 10YR7/3 (very pale brown), soft to firm, and moist. Sand is very fine quartz grains | | |
| 16.4 | 18.0 | Silt with little Clay, 10YR7/8 (yellow), firm, and moist | | |
| 18.0 | 19.5 | Clayey Silt, 10YR7/8 (yellow), firm, slightly plastic, and moist | | |
| 19.5 | 20.0 | Gravelly Clayey Silt, 10YR7/8 (yellow), very firm to stiff, and slightly moist. Gravel is subangular chert, 0.2- to 0.5-inch diameter | | |
| 20.0 | 25.0 | Sandy Silt with some Gravel, 7.5YR5/8 (strong brown) mottled with 7.5YR7/1 (light gray) and 7.5YR6/1 (gray), firm, and moist. Gravel is subrounded chert, 0.2- to 0.8-inch diameter | | HU2 |
| 25.0 | 25.7 | Silty Sand, 7.5YR7/1 (light gray), firm, and very moist. Sand consists of fine and coarse grains. Coarse grains are 1- to 3-mm in diameter and colored white and rose | | |
| 25.7 | 27.0 | Silty Sand, 7.5YR7/6 (reddish brown) with inclusions of 7.5YR8/1 (white), firm, and moist. Sand consists of fine and coarse grains. Coarse grains are 1- to 3-mm in diameter (trace subangular grains, 5- to 6-mm diameter) | | |
| 27.0 | 27.2 | Silty Sand, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | |
| 27.2 | 28.0 | Gravelly Silty Sand, 7.5YR6/8 (reddish yellow). Sand is fine to coarse (1- to 4-mm diameter), subangular grains. Gravel is subangular to subrounded chert, 0.5 to 0.8-inch diameter | | |
| 28.0 | 30.6 | Silty Sand with trace Gravel, 10YR7/1 (light gray), firm, and moist. Sand is fine quartz grains. Gravel is colored rose and white, 0.5-inch diameter | | |

**211-A-011**

Plant North -2048.2, Plant East -4995.49 8/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 30.6 | 33.0 | Gravelly Sand, 7.5YR6/8 (reddish yellow), semi-loose, and very moist. Sand is coarse grains (1- to 5-mm diameter). Gravel is subangular chert, 0.2- to 0.5-inch diameter | | |
| 33.0 | 33.4 | Silty Sand with little Gravel, 10YR7/1 (light gray), firm, and moist | | |
| 33.4 | 35.9 | Silty Gravelly Sand, 7.5YR6/6 (reddish yellow),moderately soft to firm, and moist. Gravel (10% of soil) is subangular chert, 0.2- to 1.0-inch diameter | | |
| 35.9 | 37.5 | Sandy Silt, 7.5YR7/8 (reddish brown) with inclusions of 7.5YR7/1 (light gray), soft to firm, and moist | | |
| 37.5 | 39.4 | Silty Clay, 7.5YR7/1 (light gray) speckled with 7.5YR3/1 (very dark gray), firm, slightly plastic to plastic, and moist | | HU3 |
| 39.4 | 40.0 | Silt, 10YR6/3 (pale brown) with zones of 10YR4/1 (dark gray), moderately soft, moderately plastic, and moist | | |
| 40.0 | 42.6 | Silt, 10YR7/1 (light gray), soft, moderately plastic, and moist | | |
| 42.6 | 45.0 | Very Clayey Silt, 10YR7/3 (very pale brown) mottled with 5YR5/8 (yellowish red), firm to stiff, plastic, and slightly moist | | |
| 45.0 | 48.0 | Silt, 7.5YR5/8 (strong brown) with some 7.5YR7/1 (light gray) banding, firm, slightly plastic, and slightly moist | | |
| 48.0 | 49.0 | Silty Clay, 7.5YR5/8 (strong brown) with 7.5YR7/1 (light gray) banding, firm, plastic, and slightly moist | | |
| 49.0 | 51.3 | Silt with trace Sand, 10YR7/1 (light gray), soft, and very moist. Sand is very fine quartz grains | | |
| 51.3 | 52.2 | Sandy Silt, 10YR6/8 (yellowish brown), with 10YR7/2 (light gray) mottling, firm, and slightly moist. Sand is very fine quartz grains | | |
| 52.2 | 52.4 | Gravelly Sandy Silt, 10YR6/8 (yellowish brown), with 10YR7/2 (light gray) mottling, firm, and slightly moist. Sand is very fine quartz grains | | |
| 52.4 | 55.0 | Clayey Silt, 10YR7/2 (light gray) with 10YR7/8 (yellow) mottling, firm, plastic, and slightly moist | | |
| 55.0 | 57.5 | Silty Clay, 10YR7/1 (light gray) with vertical mottling by 2.5YR4/8 (red), stiff, moderately plastic, and slightly moist | | |
| 57.5 | 58.8 | Sandy Silt, 10YR7/6 (yellow) with laminations of 7.5YR6/8 (reddish yellow), firm, and moist | | |
| 58.8 | 60.8 | Clayey Silt, 10YR7/2 (light gray) mottled with 7.5YR6/8 (reddish yellow), firm, and slightly moist | | |
| 60.8 | 62.0 | Sand, 7.5YR6/8 (reddish yellow), soft to loose, and wet | | |

**211-A-011**

Plant North -2048.2, Plant East -4995.49 8/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 62.0 | 62.7 | Sand, 10YR8/1 (white), loose, and wet. Sand is very fine quartz grains | | HU4 |
| 62.7 | 64.5 | Silt, 10YR8/1 (white), soft, plastic, and wet | | |
| 64.5 | 65.0 | Sand and Gravel, wet. Sand is composed of fine and coarse grains. Gravel is subrounded chert, 0.5- to 1.0-inch diameter | | HU5 |

**211-A-012**

Plant North -2043.984, Plant East -4973.547 9/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.1 | Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.5-inch diameter | | Fill |
| 3.1 | 15.2 | Silt, 10YR7/2 (light gray) mottled with 10YR7/4 (very pale brown), soft, nonplastic to slightly plastic, and moist | | HU1 |
| 15.2 | 18.6 | Silt with little Clay and Gravel, 10YR7/2 (light gray) with some 10YR7/3 (very pale brown) mottling, moderately hard, moderately plastic, and moist. Gravel is rounded to subangular chert without iron patina, 0.3-inch diameter | | |
| 18.6 | 18.9 | Gravely Sand with little Silt, 10YR5/4 (yellowish brown), firm, and slightly moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 4 mm- to 0.4-inch diameter | | HU2 |
| 18.9 | 19.9 | Silty Sand with some Gravel, 10YR7/2 (light gray), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 19.9 | 21.4 | Silty Sand with little Gravel, 7.5YR7/2 (pinkish gray), firm, and moist. Sand consists of 70% fine quartz grains and 30% very coarse, subrounded, chert grains. Gravel is subrounded chert without(?) iron patina, 4 mm- to 0.3-inch diameter | | |
| 21.4 | 22.6 | Sand, 7.5YR7/6 (reddish yellow) GRADING DOWN to 10YR7/6 (yellow) mottled with 10YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 22.6 | 23.6 | Gravelly Sand with Silt, 10YR6/6 (brownish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.4- to 0.8-inch diameter | | |
| 23.6 | 25.1 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 25.1 | 25.9 | Silt with Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 25.9 | 28.1 | Sand with Gravel, 7.5YR6/8 (reddish yellow) with some 7.5YR8/1 (white) mottling, firm-to-dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 4 mm- to 0.8-inch diameter | | |
| 28.1 | 29.1 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 29.1 | 30.0 | Sand with Gravel as 25.9 to 28.1 ft | | |
| 30.0 | 32.1 | Sand with Gravel, 10YR6/4 (light yellowish brown), firm-to-dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded chert with(?) iron patina, 0.3- to 0.9-inch diameter | | |

**211-A-012**

Plant North -2043.984, Plant East -4973.547 9/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 32.1 | 35.6 | Silt, 7.5YR7/4 (pink), soft, moderately plastic, and moist | | HU3 |
| 35.6 | 37.5 | Silt with Sand, 10YR8/3 (very pale brown), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 37.5 | 44.9 | Silt GRADING DOWN to Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic to plastic, and moist | | |
| 44.9 | 48.1 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), very soft, moderately plastic, and moist | | |
| 48.1 | 48.6 | Silty Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | |
| 48.6 | 50.1 | Silt as 44.9 to 48.1 ft | | |
| 50.1 | 50.8 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 50.8 | 51.2 | Clay, 7.5YR6/4 (light brown) mottled with 7.5YR8/1 (white), moderately hard, plastic, and moist | | |
| 51.2 | 54.6 | Silt with Clay, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) mottling, moderately soft, moderately plastic, and moist | | |
| 54.6 | 55.6 | Clay as 50.8 to 51.2 ft | | |
| 55.6 | 57.4 | Silt with some Sand, 10YR8/3 (very pale brown), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 57.4 | 62.7 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | HU4 |
| 62.7 | 65.0 | Sand with Gravel, 10YR8/3 (very pale brown), firm, and wet. Sand is 80% fine quartz grains and 20% coarse, rounded, chert gains. Gravel is rounded to subrounded chert without iron patina, 4 mm- to 0.5-inch diameter | | |

**211-A-013**

Plant North -2066.264, Plant East -5194.135 9/5/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.8 | Missing | | **Missing and Fill** |
| 3.8 | 4.2 | Fill: Sandy Silty Gravel, 10YR7/1 (light gray), loose, and moist. Gravel is rounded chert, 0.8- to 1.1-inch diameter. Sand is fine quartz grains | | |
| 4.2 | 4.8 | Fill: Gravelly Sand, 2.5YR6/8 (light red), loose, and moist. Sand is fine quartz grains. Gravel is rounded chert, 0.8- to 1.1-inch diameter | | |
| 4.8 | 4.9 | Wood fragments, 10YR2/1 (black) | | |
| 4.9 | 5.0 | Silt, 10YR7/1 (light gray) with greenish tinge, soft, nonplastic, and moist | | HU1 |
| 5.0 | 5.1 | Silt as 4.9 to 5.0 ft | | |
| 5.1 | 17.2 | Silt, 10YR8/1 (white) mottled with 10YR7/6 (yellow), moderately soft to soft, nonplastic, and moist | | |
| 17.2 | 19.5 | Sand, 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is very fine GRADING DOWN to fine quartz grains | | HU2 |
| 19.5 | 19.8 | Sand with Gravel, 10YR7/4 (very pale brown), hard, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert, 0.2- to 0.4-inch diameter | | |
| 19.8 | 21.7 | Clayey Silt with some Gravel, 10YR7/1 (light gray), hard, moderately plastic, and slightly moist. Gravel is rounded chert without iron patina, 0.2- to 0.3-inch diameter | | |
| 21.7 | 23.0 | Sandy Silt with Gravel, 10YR7/2 (light gray), moderately soft, slightly plastic, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without iron patina, 4 mm- to 0.6-inch diameter | | |
| 23.0 | 24.7 | Sandy Gravel with Silt, 10YR7/4 (very pale brown), hard, and moist. Gravel is rounded to subrounded chert without iron patina, 0.3- to 0.7-inch diameter. Sand is fine quartz grains | | |
| 24.7 | 25.7 | Sandy Silt, 10YR8/1 (white) mottled with 10YR7/6 (yellow), moderately soft, nonplastic, and moist | | |
| 25.7 | 27.3 | Sand, 10YR7/6 (yellow) with some 10YR8/1 (white) laminations, lightly consolidated, and moist. Sand is fine quartz grains | | |
| 27.3 | 32.5 | Sandy Silt with some Gravel, 7.5YR8/2 (pinkish white) mottled with 7.5YR8/1 (white), moderately soft, nonplastic, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert with iron patina, 0.3- to 1.0-inch diameter | | |
| 32.5 | 35.7 | Sandy Silty Gravel, 10YR7/4 (very pale brown), lightly consolidated, and moist. Gravel is rounded to subrounded chert with iron patina, 0.3- to 1.0-inch diameter. Sand is fine quartz grains | | |

**211-A-013**

Plant North -2066.264, Plant East -5194.135 9/5/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 35.7 | 37.4 | Clayey Silt, 10YR7/4 (pink), very soft, slightly plastic, and moist | | |
| 37.4 | 45.0 | Sandy Silt, 10YR8/1 (white) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist | | |
| 45.0 | 46.0 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist | | |
| 46.0 | 46.3 | Silt with Gravel, 7.5YR6/6 (reddish yellow), soft, moderately plastic, and moist. Gravel is rounded to subrounded chert with iron patina, 0.3-inch diameter | | |
| 46.3 | 46.5 | Silt, 7.5YR6/6 (reddish yellow), soft, moderately plastic, and moist | | |
| 46.5 | 48.1 | Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), lightly consolidated/ moderately soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 48.1 | 50.0 | Clayey Silt, mottled 7.5YR7/4 (pink) and 7.5YR8/1 (white), soft to moderately soft, plastic, and moist | | |
| 50.0 | 51.7 | Sandy Silt, 7.5YR8/2 (pinkish white) mottled with 7.5YR7/4 (pink) and with some 7.5YR3/1 (very dark gray) blebs (manganese?), soft, moderately plastic to slightly plastic, and moist | | |
| 51.7 | 52.1 | Sand, 7.5YR8/2 (pinkish white) GRADING DOWN to 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains | | |
| 52.1 | 52.3 | Clay, 7.5YR7/2 (pinkish gray), moderately soft, plastic, and moist | | |
| 52.3 | 54.5 | Sand, 7.5YR7/4 (pink) with few 7.5YR8/1 (white) laminations, lightly consolidated, and moist. Sand is fine quartz grains | | HU3 |
| 54.5 | 54.8 | Gravelly Sand, 7.5YR7/4 (pink), loose, and very moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.3- to 0.8-inch diameter | | |
| 54.8 | 55.9 | Sand with trace Gravel, 7.5YR7/4 (pink), loose, and very moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert with iron patina, 4 mm- to 0.3-inch diameter | | |
| 55.9 | 56.2 | Sandy Gravel, 7.5YR7/4 (pink), loose, and very moist. Gravel is rounded to subrounded chert with iron patina, 4 mm- to 0.3-inch diameter. Sand is fine quartz grains | | |
| 56.2 | 56.4 | Sand, 10YR8/4 (very pale brown), loose, and wet. Sand is very fine quartz grains | | |
| 56.4 | 56.8 | Gravelly Sand, 10YR6/6 (brownish yellow), loose, and moist. Sand is predominately fine quartz grains but includes coarse, subrounded, chert grains. Gravel is rounded to subrounded chert with iron patina, 0.2- to 1.0-inch diameter | | |

**211-A-013**

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology Plant North -2066.264, Plant East -5194.135 | | Hydrogeologic Unit 9/5/2012 |
|---|---|---|---|---|
| 56.8 | 58.4 | Slightly Clayey Silt, 10YR8/1 (white) with abundant 10YR7/6 (yellow) laminations, moderately soft, moderately plastic, and moist | | |
| 58.4 | 59.8 | Clayey Silt, 5YR8/1 (white) with abundant 5YR7/8 (reddish yellow) laminations, moderately soft, plastic, and moist | | |
| 59.8 | 62.6 | Silt, 10YR8/6 (yellow) with 10YR8/1 (white) mottling, soft, slightly plastic, and moist | | |
| 62.6 | 64.2 | Sand, 10YR8/4 (very pale brown) with 10YR7/6 (yellow) laminations GRADING DOWN to 10YR8/1 (white), lightly consolidated, and moist. Sand is very fine to fine quartz grains | | HU4 |
| 64.2 | 65.0 | Gravelly Sand, 10YR8/2 (very pale brown), loose, and moist. Sand is predominately fine quartz grains but includes 15 to 20% coarse, subangular, chert grains. Gravel is subrounded to rounded chert with iron patina, 0.2- to 1.0-inch diameter | | |

**211-A-014**

Plant North -2065.901, Plant East -5119.305 9/5/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.5 | Silt, 10YR6/3 (pale brown), soft (crumbles to powder), nonplastic, and dry | | Fill |
| 0.5 | 3.4 | Sandy Gravel, 5YR5/8 (yellowish red), loose, and moist. Gravel is rounded to subrounded chert with iron patina, 0.2- to 0.8-inch diameter. Sand is fine quartz grains | | |
| 3.4 | 5.0 | Silt, 10YR7/1 (light gray) with green tinge, moderately soft, nonplastic, and slightly moist | | HU2 |
| 5.0 | 15.0 | Silt, 10YR7/1 (light gray) with some 10YR7/6 (yellow) mottling | | |
| 15.0 | 18.4 | Silt, 10YR6/4 (light yellowish brown) with some 10YR7/1 (light gray) mottling | | |
| 18.4 | 22.3 | Clayey Silt, 10YR7/2 (light gray), moderately hard, slightly to moderately plastic, and slightly moist. Trace of subrounded to subangular chert gravel (with little iron patina), 0.2- to 0.4-inch diameter | | |
| 22.3 | 25.0 | Silty Sandy Gravel, 10YR6/3 (pale brown), dense/hard, and moist. Gravel is subangular chert with little iron patina, 4 mm- to 0.3-inch diameter. Sand is fine quartz grains | | HU3 |
| 25.0 | 28.8 | Interbedded Sand and Silt, 10YR6/4 (light yellowish brown) with some 10YR8/1 (white) mottling, lightly consolidated/soft, nonplastic to slightly plastic, and moist. Sand is very fine quartz grains | | |
| 28.8 | 33.1 | Gravelly Sand, 10YR6/3 (pale brown) mottled with 10YR8/1 (white), moderately dense/hard, and moist. Sand is very fine quartz grains. Gravel is subrounded chert with light iron patina, 0.3- to 1.1-inch diameter | | |
| 33.1 | 34.5 | Gravelly Sand as 28.8 to 33.1 ft but with some Clay | | |
| 34.5 | 35.8 | Sand, 10YR7/4 (very pale brown), lightly consolidated, and moist. Sand is fine quartz grains | | |
| 35.8 | 37.5 | Silty Sandy Gravel, 10YR7/2 (light gray), moderately dense/hard, and moist. Gravel is rounded to subangular chert with iron patina, 0.3- to 1.0-inch diameter. Sand is fine quartz grains | | |
| 37.5 | 38.7 | Silty Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, lightly consolidated/soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 38.7 | 39.8 | Clayey Silt, 10YR7/2 (light gray), soft, plastic, and very moist | | |
| 39.8 | 40.6 | Sand, 10YR8/1 (white), loose, and wet. Sand is very fine quartz grains | | |
| 40.6 | 42.4 | Clayey Silt, 10YR8/2 (very pale brown) with light 10YR7/6 (yellow) mottling, moderately soft, moderately plastic, and moist | | |

**211-A-014**

Plant North -2065.901, Plant East -5119.305 9/5/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 42.4 | 43.4 | Sand, 10YR8/2 (very pale brown), lightly consolidated, and very moist. Sand is fine quartz grains | | HU3 |
| 43.4 | 45.8 | Clayey Silt, 10YR8/2 (very pale brown) with light mottling by 10YR7/6 (yellow), moderately soft, moderately plastic, and moist | | |
| 45.8 | 49.6 | Silt with Sand, 10YR8/2 (very pale brown) with some 10YR7/4 (very pale brown) mottling and laminations, soft, slightly plastic to nonplastic, and moist. Sand is very fine quartz grains | | |
| 49.6 | 52.4 | Sand, 10YR8/1 (white) with 10YR7/6 (yellow) mottling, lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 52.4 | 54.2 | Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations and staining, lightly consolidated and moist. Sand is fine quartz grains | | |
| 54.2 | 56.9 | Gravelly Sand, 10YR7/2 (light gray), loose, and moist. Sand is fine to medium quartz grains. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 56.9 | 58.4 | Clayey Silt, 7.5YR7/4 (pink) with some 7.5YR7/1 (light gray) mottling, soft, moderately plastic, and moist | | |
| 58.4 | 60.0 | Silt with some Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 60.0 | 60.2 | Clay, 10YR8/1 (white), soft, plastic, and moist | | |
| 60.2 | 62.0 | Sand with Silt, 10YR8/1 (white) with some 10YR7/6 (yellow) mottling, lightly consolidated/soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 62.0 | 63.5 | Sand, 10YR7/6 (yellow), lightly consolidated, and moist. Sand is fine quartz grains | | HU4 |
| 63.5 | 63.8 | Clay as 60.0 to 60.2 ft | | |
| 63.8 | 64.0 | Sandy Gravel, 10YR6/4 (light yellowish brown), loose, and moist. Gravel is subangular to subrounded chert with iron patina, 0.2- to 0.4-inch diameter. Sand is equal parts fine quartz grains and medium and coarse, subrounded, chert grains | | HU5 |

**211-A-015**

Plant North -2066.201, Plant East -5088.967 9/6/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.4 | Fill: Silty Gravel, 10YR7/1 (light gray), loose, nonplastic, and dry. Gravel is subangular limestone, 4 mm- to 0.6-inch diameter (dense gravel aggregate/DGA) | | Fill |
| 0.4 | 3.8 | Fill: Silty Sandy Gravel, 2.5YR5/8 (red), moderately dense/hard, and moist. Gravel is subrounded to subangular chert with iron patina, 0.4- to 1.0-inch diameter. Sand is fine quartz grains | | |
| 3.8 | 5.1 | Silt, 10YR7/1 (light gray), soft, nonplastic, and moist | | HU1 |
| 5.1 | 14.8 | Silt, 10YR7/3 (very pale brown) mottled with 10YR7/1 (light gray), soft, nonplastic to slightly plastic, and moist | | |
| 14.8 | 15.8 | Silt, 10YR8/3 (very pale brown), moderately hard, nonplastic, and slightly moist | | |
| 15.8 | 17.3 | Sand, 10YR8/2 (very pale brown) with little 10YR7/4 (very pale brown) mottling, lightly consolidated/soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 17.3 | 21.6 | Clayey Silt with trace of Gravel, 10YR7/1 (light gray), moderately hard, slightly to moderately plastic, and moist. Gravel is rounded chert with light iron patina, 0.2- to 0.3-inch diameter | | |
| 21.6 | 25.5 | Gravelly Sand with Silt, 10YR7/4 (very pale brown), dense/hard, and moist. Sand is predominately fine quartz grains but includes some coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 0.2- to 0.8-inch diameter | | HU2 |
| 25.5 | 26.4 | Clayey Silt, 10YR7/3 (very pale brown) with blebs of 10YR8/1 (white), soft, plastic, and moist | | |
| 26.4 | 28.1 | Interbeds of Sand (fine quartz grains) and Clayey Silt, 7.5YR7/8 (reddish yellow) with blebs of 7.5YR8/1 (white), soft, slightly plastic, and moist | | |
| 28.1 | 33.8 | Sandy Silt, 10YR8/2 (very pale brown) with light 10YR7/6 (yellow) mottling, soft, slightly plastic, and moist | | |
| 33.8 | 35.5 | Gravelly Sand with Silt, 10YR8/2 (very pale brown) with 10YR8/1 (white) mottling GRADING DOWN to 7.5YR7/4 (pink), dense/hard, and moist. Sand is fine to medium quartz grains. Gravel is rounded to subangular chert with iron patina, 0.2- to 0.8-inch diameter | | |
| 35.5 | 37.9 | Clayey Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |
| 37.9 | 42.8 | Slightly Clayey Silt, 10YR8/1 (white) with heavy 10YR7/6 (yellow) mottling, soft, slightly plastic, and moist | | |

**211-A-015**

Plant North -2066.201, Plant East -5088.967 9/6/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 42.8 | 53.3 | Silt, 10YR8/2 (very pale brown) mottled with 10YR6/6 (brownish yellow), moderately soft, slightly plastic, and moist | | HU3 |
| 53.3 | 58.6 | Silty Sand, 10YR8/1 (white) GRADING DOWN to 10YR7/6 (yellow) mottled with 10YR8/1 (white), lightly consolidated/soft, nonplastic to slightly plastic, and moist. Sand is fine quartz grains | | |
| 58.6 | 60.8 | Clayey Silt, 10YR8/1 (white) with light 10YR7/6 (yellow) laminations, moderately soft, plastic, and moist | | |
| 60.8 | 65.6 | Sand, 10YR8/4 (very pale brown) GRADING DOWN to 10YR8/1 (white), lightly consolidated, and very moist. Sand is fine quartz grains | | HU4 |
| 65.6 | 66.0 | Sandy Gravel, 7.5YR8/2 (pinkish white), loose, and wet. Gravel is subrounded to subangular chert with iron patina, 0.3- to 1.0-inch diameter. Sand is 85% fine quartz grains and 15% coarse, subangular, chert grains | | HU5 |

**211-A-016**

Plant North -2065.945, Plant East -5059.023 9/27/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.2 | Sandy Gravel, 2.5YR6/6 (light red), dense, and moist. Gravel is subangular to subrounded chert with iron patina, 0.4- to 0.8-inch diameter. Sand is fine quartz grains | | FILL |
| 2.2 | 6.0 | Silt, 10YR7/2 (light gray) mottled with 10YR6/1 (gray), moderately hard, nonplastic, and moist | | HU1 |
| 6.0 | 14.7 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist | | HU1 |
| 14.7 | 15.8 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is very fine quartz grains | | HU1 |
| 15.8 | 16.7 | Interbedded Silt, 7.5YR7/4 (pink), soft, slightly plastic, and moist AND Sand, 7.5YR6/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | HU1 |
| 16.7 | 19.0 | Clay, 7.5YR7/6 (reddish yellow), moderately hard, plastic, and moist | | HU1 |
| 19.0 | 20.0 | Clay with some Silt and some Gravel, 10YR7/2 (light gray) with 10YR7/4 (very pale brown) mottling. Gravel is subangular chert without iron patina, 0.3- to 0.4-inch diameter AND rounded chert without iron patina, 0.6-inch diameter | | HU1 |
| 20.0 | 23.8 | Silt with Sand, 10YR8/1 (white) with 10YR7/6 (yellow) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | HU1 |
| 23.8 | 25.7 | Silty Gravel with Sand, 7.5YR6/6 (reddish yellow) with some 7.5YR3/1 (very dark gray) stain (manganese?), dense, and moist. Gravel is subrounded to subangular chert without iron patina, 4-mm to 0.6-inch diameter. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains | | HU2 |
| 25.7 | 26.1 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | HU2 |
| 26.1 | 26.4 | Gravelly Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is rounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter | | HU2 |
| 26.4 | 33.1 | Silt with Sand, 10YR8/3 (very pale brown) with 10YR7/6 (yellow) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | HU2 |
| 33.1 | 34.7 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | HU2 |
| 34.7 | 35.2 | Silty Gravel with Sand, 7.5YR6/4 (light brown), dense, and moist. Gravel is subrounded chert without iron patina, 4-mm to 0.4-inch diameter | | HU2 |
| 35.2 | 39.5 | Silt with Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, plastic, and moist | | |

**211-A-016**

Plant North -2065.945, Plant East -5059.023 9/27/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 39.5 | 43.2 | Silt, 10YR8/1 (white) mottled with 10YR7/6 (yellow), soft, slightly plastic, and moist | | HU3 |
| 43.2 | 44.9 | Silt with Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) | | |
| 44.9 | 48.0 | Silt, 10YR8/2 (very pale brown) mottled with 7.5YR5/8 (strong brown), moderately soft, moderately plastic, and moist | | |
| 48.0 | 48.9 | Clay with Silt, 10YR8/3 (very pale brown), moderately hard, plastic, and moist | | |
| 48.9 | 49.6 | Silt with Sand and Gravel, 10YR8/2 (very pale brown), moderately hard, nonplastic, and moist. Sand is very fine quartz grains. Gravel is subrounded chert without iron patina, 4-mm to 0.7-inch diameter | | |
| 49.6 | 50.0 | Sand, 10YR8/1 (white) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 50.0 | 51.0 | Clay with Silt, 10YR8/2 (very pale brown) mottled with 7.5YR7/6 (reddish yellow), moderately hard, plastic, and moist | | |
| 51.0 | 54.9 | Silt with Sand, 10YR8/1 (white) mottled with 10YR7/6 (yellow) and 7.5YR7/6 (reddish yellow), moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 54.9 | 56.8 | Clay with some Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately soft, plastic, and moist | | |
| 56.8 | 58.1 | Sand, 10YR8/2 (very pale brown) with 10YR8/6 (yellow) staining, lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 58.1 | 60.2 | Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist | | |
| 60.2 | 65.0 | Sand, 10YR8/2 (very pale brown) with 7.5YR8/4 (pink) mottling, lightly consolidated, and moist. Sand is very fine quartz grains | | HU4 |
| 65.0 | 65.2 | Sandy Gravel, 10YR4/2 (dark grayish brown) (stained with manganese?), loose, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.6-inch diameter. Sand is fine quartz grains | | HU5 |

**211-A-017**

Plant North -2066.342, Plant East -5029.003 9/21/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.1 | Gravelly Sand, 2.5YR6/4 (light reddish brown), loose, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, quartz grains. Gravel is subangular to subrounded chert with iron patina, 4-mm to 0.5-inch diameter | | Fill |
| 2.1 | 5.1 | Silt, 10YR7/1 (light gray), moderately soft, nonplastic, and moist | | HU1 |
| 5.1 | 17.6 | Silt, 10YR7/2 (light gray) with 10YR7/6 (yellow) mottling, soft, slightly plastic, and moist | | |
| 17.6 | 18.3 | Sand, 7.5YR6/4 (light brown), loose, and wet. Sand is very fine quartz grains | | |
| 18.3 | 20.1 | Silt with little Clay, 7.5YR8/1 (white) with heavy mottling by 7.5YR7/6 (reddish yellow), moderately hard, moderately plastic, and moist | | |
| 20.1 | 21.6 | Gravelly Sand with some Silt, 7.5YR6/4 (light brown), moderately dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4-mm to 0.4-inch diameter | | HU2 |
| 21.6 | 22.0 | Sandy Silt with some Clay, 10YR8/2 (very pale brown), soft, slightly plastic, and wet | | |
| 22.0 | 22.8 | Sand, 10YR7/3 (Very pale brown), loose, and wet. Sand is very fine quartz grains | | |
| 22.8 | 23.7 | Silt GRADING DOWN to Sand, 10YR7/3 (very pale brown), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 23.7 | 24.3 | Silt with some Clay and little Gravel, 10YR7/1 (light gray), moderately hard, plastic, and moist | | |
| 24.3 | 26.0 | Sandy Gravel with little Silt, 10YR7/4 (very pale brown), loose, and moist. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.8-inch diameter. Sand is fine quartz grains | | |
| 26.0 | 27.0 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 27.0 | 27.3 | Sandy Gravel with little Silt as 24.3 to 26.0 ft | | |
| 27.3 | 30.0 | Silt with little Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 30.0 | 32.5 | Silt, 7.5YR7/4 (pink), moderately hard, slightly plastic, and moist | | |
| 32.5 | 34.0 | Sand with Gravel, 7.5YR7/6 (reddish yellow) GRADING DOWN to 7.5YR8/2 (pinkish white), dense, and moist. Sand is very fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.8-inch diameter | | |
| 34.0 | 35.0 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is very fine to fine quartz grains | | |
| 35.0 | 39.0 | Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |

**211-A-017**

Plant North -2066.342, Plant East -5029.003 9/21/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 39.0 | 42.6 | Silt with little Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist. Sand is very fine quartz grains | | HU3 |
| 42.6 | 47.1 | Silt with little Clay, 10YR7/3 (very pale brown) with 10YR7/6 (yellow) and 10YR7/1 (light gray) mottling, soft, slightly plastic, and moist | | |
| 47.1 | 50.0 | Silt with Clay, 7.5YR7/1 (light gray) mottled with 7.5YR7/4 (pink), soft, moderately plastic, and moist | | |
| 50.0 | 51.6 | Silt, 10YR7/1 (light gray), soft, moderately plastic, and moist | | |
| 51.6 | 52.6 | Silt with Sand, 10YR7/1 (light gray), firm/moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 52.6 | 53.7 | Sand, 7.5YR7/6 (reddish yellow) with 7.5YR8/1 (white) mottling, firm, and moist. Sand is fine quartz grains | | |
| 53.7 | 58.4 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/1 (white), soft, moderately plastic, and moist | | |
| 58.4 | 61.0 | Clay with Silt, 10YR8/2 (very pale brown), soft, plastic, and moist | | |
| 61.0 | 64.4 | Sand, 10YR8/2 (very pale brown) GRADING DOWN to 10YR7/3 (very pale brown), lightly consolidated to loose, and moist to wet. Sand is very fine quartz grains | | HU4 |
| 64.4 | 65.0 | Silt with little Clay, 10YR8/1 (white), soft, moderately plastic, and moist | | |
| 65.0 | 65.1 | Sand as 61.0 to 64.4 ft | | |
| 65.1 | 65.2 | Sandy Gravel. Gravel is subangular chert with iron patina, 0.4- to 1.0 inch diameter | | HU5 |

**211-A-018**

Plant North -2066.381, Plant East -4994.899 9/12/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.0 | Concrete and gravel | | FILL |
| 1.0 | 5.0 | Silt, 10YR7/1 (light gray), firm, and moist | | |
| 5.0 | 7.0 | Silt, 10YR7/1 (light gray) mottled with 7.5YR7/8 (reddish yellow), firm, and slightly moist | | |
| 7.0 | 10.0 | Silt, 10YR7/1 (light gray) mottled with 7.5YR7/8 (reddish yellow) and containing blebs of 10YR4/1 (dark gray), firm, and slightly moist | | |
| 10.0 | 13.5 | Silt, 10YR7/1 (light gray) with slight mottling by 10YR6/8 (brownish yellow), moderately firm, and slightly moist | | |
| 13.5 | 15.0 | Silt, 10YR6/8 (brownish yellow), moderately firm, and slightly moist | | |
| 15.0 | 18.5 | Silt, 10YR7/4 (very pale brown), firm, and slightly moist | | HU1 |
| 18.5 | 20.0 | Gravelly Silty Clay, 10YR7/2 (light gray) intermixed with 10YR5/8 (dark yellowish brown), stiff, and slightly moist. Gravel is subrounded chert with and without (white) iron patina, 0.5- to 1.2-inch diameter | | |
| 20.0 | 23.5 | Silty Clayey Sand with trace Gravel, 10YR5/6 (yellowish brown), firm, and slightly moist. Sand is medium to coarse grained | | |
| 23.5 | 25.0 | Clayey Sand, 10YR7/1 (light gray) mottled with 10YR6/8 (brownish yellow), firm, and slightly moist. Sand is fine to medium quartz grains | | |
| 25.0 | 28.7 | Clayey Gravelly Sand, 7.5YR5/8 (strong brown), firm, and slightly moist. Sand is fine to coarse grained. Gravel is subrounded to subangular chert, 0.5- to 0.8-inch diameter | | |
| 28.7 | 30.0 | Silty Sand, 10YR7/2 (light gray), semi-firm, and slightly moist | | HU2 |
| 30.0 | 35.9 | Silty Gravelly Sand, 7.5YR6/8 (reddish yellow). Sand is medium to coarse quartz grains. Gravel (5 to 10% of sample) is chert, 0.2- to 1.0-inch diameter | | |
| 35.9 | 41.0 | Intermixed Silts, 10YR7/1 (light gray) and 7.5YR7/8 (reddish yellow), moderately soft, and very moist | | |
| 41.0 | 41.5 | Sandy Silt, 10YR5/4 (yellowish brown), moderately soft, and moist | | |
| 41.5 | 44.5 | Silt, 10YR7/1 (light gray) mottled with 5YR6/8 (reddish yellow) | | |
| 44.5 | 45.0 | Silty Sand, 10YR7/2 (light gray), firm, and slightly moist | | |
| 45.0 | 52.0 | Silty Sand, 7.5YR7/1 (light gray) mottled with 7.5YR6/8 (reddish yellow), moderately firm, and slightly moist | | |
| 52.0 | 55.0 | Silty Gravelly Sand, 10YR7/1 (light gray) mottled with 7.5YR6/8 (reddish yellow), firm, and slightly moist. Gravel is subrounded chert, 0.2- to 0.8-inch diameter | | HU3 |

**211-A-018**

Plant North -2066.381, Plant East -4994.899 9/12/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 55.0 | 56.3 | Clayey Silt, 10YR7/1 (light gray) mottled with 7.5YR5/8 (strong brown), stiff, and moist | | |
| 56.3 | 57.0 | Sand, 10YR7/1 (light gray), loose, and saturated (flowing) | | |
| 57.0 | 57.5 | Silty Clay, 7.5YR5/8 (strong brown), firm, and slightly moist | | |
| 57.5 | 58.6 | No recovery | | |
| 58.6 | 60.9 | Clayey Silt, 5YR7/6 (reddish yellow) mottled with 5YR8/1 (white), moderately hard, slightly plastic, and moist | | |
| 60.9 | 62.1 | Sand, 10YR8/1 (white) with 10YR7/6 (yellow) laminations, lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 62.1 | 63.7 | Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft, slightly plastic, and moist | | HU4 |
| 63.7 | 64.1 | Sand, 10YR8/1 (white), loose, and wet. Sand is very fine quartz grains | | |
| 64.1 | 64.4 | Gravelly Sand, 10YR7/3 (very pale brown), loose, and wet. Sand is very fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.2- to 0.5-inch diameter | | |
| 64.4 | 65.0 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and wet. Gravel is subangular to subrounded chert with iron patina, 0.3- to 1.0-inch diameter. Sand is 80% very fine quartz grains and 20% coarse, rounded, chert with iron patina grains | | HU5 |

**211-A-019**

Plant North -2066.175, Plant East -4974.143 9/12/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.8 | Gravelly Silt, 10YR7/1 (light gray), loose, and slightly moist. Gravel is subangular limestone, 0.2- to 0.4-inch diameter (dense gravel aggregate/DGA) | | FILL |
| 1.8 | 4.2 | Silt, 10YR7/1 (light gray) with light blue tinge, soft, nonplastic, and slightly moist | | HU1 |
| 4.2 | 14.9 | Silt, 10YR8/2 (very pale brown) with variable mottling by 10YR7/6 (yellow), soft, slightly plastic, and moist. Note: some 10YR3/1 (very dark gray) mottling (manganese?) beginning at 13.0 ft | | |
| 14.9 | 18.9 | Silt, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, moderately soft, moderately plastic, and moist | | |
| 18.9 | 20.6 | Clayey Silt with little Gravel, 10YR7/1 (light gray), moderately hard to hard, slightly to moderately plastic, and moist. Gravel is rounded chert, predominately 0.3-inch diameter but up to 0.7-inch diameter | | |
| 20.6 | 21.1 | Gravelly Sand with Silt, 7.5YR6/6 (Reddish yellow), firm, and moist. Sand is very fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.4-inch diameter | | |
| 21.1 | 22.2 | Clayey Silt with some Gravel, 7.5YR7/1 (light gray) mottled with 7.5YR7/6 (reddish yellow), moderately soft, plastic, and moist | | |
| 22.2 | 22.5 | Silt, 10YR8/1 (white), soft, nonplastic, and moist | | |
| 22.5 | 23.2 | Sand, 7.5YR6/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | HU2 |
| 23.2 | 23.6 | Gravelly Sand with Silt as 20.6 to 21.1 ft | | |
| 23.6 | 24.9 | Silt with Sand, 7.5YR8/1 (white) with little 7.5YR7/6 (yellow) mottling, moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 24.9 | 26.0 | Sandy Gravel, 7.5YR7/4 (pink), dense, and slightly moist. Gravel is subangular chert with no-to-little iron patina, 4-mm to 0.6-inch diameter. Sand is 60% fine quartz grains and 40% coarse, rounded, chert grains | | |
| 26.0 | 27.2 | Silty Gravelly Sand, 10YR7/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert with light iron patina, 0.4- to 1.0-inch diameter | | |
| 27.2 | 28.9 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist | | |
| 28.9 | 33.2 | Silty Gravelly Sand, 7.5YR5/6 (strong brown), dense, and moist. Sand is 60% fine quartz grains and 40% coarse, rounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.7-inch diameter | | |

**211-A-019**

Plant North -2066.175, Plant East -4974.143 9/12/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 33.2 | 34.5 | Sand GRADING DOWN to Sand with Gravel, 7.5YR8/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is subangular chert with iron patina, 0.4- to 0.5-inch diameter | | |
| 34.5 | 35.3 | Sandy Gravel with Silt, 10YR5/1 (gray) (stained with manganese?) GRADING DOWN to 10YR6/4 (light yellowish brown), dense, and moist. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.8-inch diameter. Sand is fine quartz grains | | |
| 35.3 | 39.0 | Slightly Clayey Silt, 7.5YR7/4 (pink) with 7.5YR7/1 (light gray) mottling GRADING DOWN to 7.5YR6/1 (gray), moderately hard, slightly plastic, and moist | | HU3 |
| 39.0 | 42.1 | Silt, 10YR7/3 (very pale brown), moderately soft to moderately hard, slightly plastic, and moist | | |
| 42.1 | 43.6 | Slightly Clayey Silt, 10YR6/2 (light brownish gray), moderately hard, moderately plastic, and moist | | |
| 43.6 | 44.8 | Silt, 10YR6/3 (pale brown), moderately soft, nonplastic, and moist | | |
| 44.8 | 47.0 | Slightly Clayey Silt as 42.1 to 43.6 ft | | |
| 47.0 | 50.5 | Slightly Clayey Silt, 7.5YR6/8 (reddish yellow) mottled with 7.5YR7/1 (light gray), moderately hard, slightly plastic, and moist | | |
| 50.5 | 54.6 | Silt, 10YR8/3 (very pale brown) mottled with 10YR7/1 (light gray) and 10YR7/6 (yellow), moderately soft, slightly plastic, and moist | | |
| 54.6 | 58.3 | Slightly Clayey Silt, 7.5YR8/4 (pink) mottled with 7.5YR8/1 (white) and 7.5YR6/8 (reddish yellow), moderately hard, slightly plastic, and moist | | |
| 58.3 | 61.0 | Silt with Sand, 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 61.0 | 63.0 | Sand, 10YR8/3 (very pale brown) with some 10YR7/8 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | HU4 |
| 63.0 | 64.0 | Silt, 10YR8/1 (white) with 10YR7/6 (yellow) laminations, loose, nonplastic, and moist | | |
| 64.0 | 65.0 | Gravelly Sand, 7.5YR7/3 (pink), loose, and wet. Sand is 80% fine quartz grains and 20% coarse, subangular, chert grains. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 1.0-inch diameter | | HU5 |

**211-A-020**

Plant North -2085.988, Plant East -5035.164 9/24/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.9 | Silty Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.4- to 0.6-inch diameter | | FILL |
| 3.9 | 14.9 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic to slightly plastic, and moist | | HU1 |
| 14.9 | 15.2 | Sand, 10YR8/1 (white), dense, and moist. Sand is very fine quartz grains | | |
| 15.2 | 18.3 | Silt, 10YR6/6 (brownish yellow) mottled with 10YR8/2 (very pale brown), soft, nonplastic, and moist | | |
| 18.3 | 19.8 | Silty Clay, 10YR7/1 (light gray), moderately hard, moderately plastic, and moist | | |
| 19.8 | 20.9 | Silt with some Gravel, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist. Gravel is rounded chert without iron patina, 0.5-inch diameter | | |
| 20.9 | 21.5 | Sand with Gravel, 7.5YR6/6 (reddish yellow), lightly consolidated, and moist. Sand is fine to medium, rounded, quartz grains. Gravel is subangular chert without iron patina, 0.3- to 0.4-inch diameter | | HU2 |
| 21.5 | 22.3 | Silty Gravel with Sand, 7.5YR6/4 (light brown), dense, and moist. Gravel is rounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter. Sand is fine quartz grains | | |
| 22.3 | 22.8 | Clay, 10YR7/1 (light gray), moderately soft, plastic, and moist | | |
| 22.8 | 24.4 | Gravelly Sand, 7.5YR7/4 (pink) with some staining by 7.5YR3/1 (very dark gray) (manganese?), firm, and moist. Sand is fine quartz grains. Gravel is subangular chert with iron patina, 0.4- to 0.6-inch diameter | | |
| 24.4 | 26.8 | Sand with Gravel, 10YR7/3 (very pale brown), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.4- to 0.6-inch diameter | | |
| 26.8 | 27.4 | Sandy Gravel, 10YR8/3 (very pale brown), loose, and moist. Gravel is rounded to subrounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 27.4 | 30.9 | Silt, 10YR7/3 (very pale brown) with little mottling by 10YR8/1 (white), soft, nonplastic, and moist | | |
| 30.9 | 31.7 | Silt with some Gravel, 10YR7/3 (very pale brown) with little mottling by 10YR8/1 (white), soft, plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.4-inch diameter | | |

**211-A-020**

Plant North -2085.988, Plant East -5035.164 9/24/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 31.7 | 32.5 | Sand with Gravel, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.4-inch diameter | | |
| 32.5 | 35.0 | No recovery | | NO RECOVERY |
| 35.0 | 35.6 | Silt with little Clay and Gravel, 10YR7/4 (very pale brown), soft, moderately plastic, and moist. Gravel is rounded chert without iron patina, 4-mm to 0.3-inch diameter | | HU3 |
| 35.6 | 39.5 | Silt with little Clay, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/1 (white), soft, plastic, and moist | | |
| 39.5 | 43.1 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/4 (very pale brown), soft, nonplastic, and moist | | |
| 43.1 | 45.0 | Silt with little Clay, 10YR7/1 (light gray) with some 10YR6/6 (brownish yellow) mottling, moderately hard, plastic, and moist. Note: red tinge over 44.5 to 45.0 ft | | |
| 45.0 | 47.5 | Silt with Sand, 10YR8/1 (white) with some 10YR6/6 (brownish yellow) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 47.5 | 53.0 | Silt with Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 53.0 | 53.4 | Sand, 10YR8/1 (white) with 2.5YR8/3 (pink) tinge, firm, and moist. Sand is very fine quartz grains | | |
| 53.4 | 54.5 | Sandy Gravel, 10YR8/1 (white) with some 10YR7/6 (yellow) staining, firm/moderately consolidated, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter. Sand is fine quartz grains | | |
| 54.5 | 55.0 | Sand with some Gravel, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.4- to 0.8-inch diameter | | |
| 55.0 | 56.9 | Silt with some Clay, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft, slightly to moderately plastic, and moist | | |
| 56.9 | 58.4 | Silt with some Sand, 10YR8/2 (very pale brown), soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 58.4 | 59.1 | Sand, 10YR8/1 (white), loose, and wet. Sand is very fine quartz grains | | |
| 59.1 | 61.1 | Silty Sand with Silt interbeds, 10YR8/1 (white) with 10YR7/6 (yellow) laminations, lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 61.1 | 62.6 | Sand, 10YR8/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |

**211-A-020**

Plant North -2085.988, Plant East -5035.164 9/24/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 62.6 | 64.6 | Sand, 10YR8/3 (very pale brown), loose, and wet. Sand is very fine quartz grains | | HU4 |
| 64.6 | 65.0 | Silt, 10YR8/1 (white), soft, plastic, and moist | | |
| 65.0 | 65.3 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 65.3 | 67.5 | Sandy Gravel, 10YR6/3 (pale brown), loose, and wet. Gravel is subangular to subrounded chert, 0.3- to 1.0-inch diameter. Sand is 75% fine to medium, rounded, quartz grains and 25% coarse, rounded, chert grains. Note: 10YR5/1 (gray) staining (manganese?) over 66.1 to 66.5 ft | | HU5 |

**211-A-021**

Plant North -2096.095, Plant East -5089.217 9/6/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.0 | No description | | Fill |
| 1.0 | 4.0 | Sandy Gravel, 2.5YR6/6 (light red), moderately dense/hard, and moist. Gravel is subrounded chert with iron patina, 0.3- to 0.4-inch diameter. Sand is fine quartz grains | | |
| 4.0 | 5.0 | Silt, 10YR7/1 (light gray) with bluish tinge, moderately hard, nonplastic, and moist | | HU1 |
| 5.0 | 15.0 | Silt, 10YR7/1 (light gray) with 10YR7/6 (yellow) staining and mottling, soft, nonplastic, and moist | | |
| 15.0 | 18.5 | Slightly Clayey Silt with some Sand, 7.5YR7/6 (reddish yellow) with little 7.5YR8/1 (white) mottling, soft, moderately plastic, and moist | | |
| 18.5 | 19.9 | Clayey Silt, 10YR7/1 (light gray) with 10YR7/4 (very pale brown) mottling, moderately hard to hard, moderately plastic, and moist | | |
| 19.9 | 20.0 | Sand, 10YR6/6 (brownish yellow), loose, and moist. Sand is very coarse, angular, chert grains | | |
| 20.0 | 20.9 | Silt, 10YR6/6 (brownish yellow), soft, slightly plastic, and moist | | |
| 20.9 | 23.4 | Clayey Silt, 10YR7/1 (light gray) with 10YR7/6 (yellow) mottling, moderately hard, moderately plastic, and moist. Trace chert gravel without iron patina, rounded, 0.2-inch diameter | | |
| 23.4 | 24.0 | Sandy Gravel with Silt, 7.5YR5/6 (strong brown), moderately dense/hard, and moist. Gravel is subangular chert with light iron patina, 0.2- to 0.3-inch diameter | | HU2 |
| 24.0 | 24.8 | Sandy Silt, 10YR8/1 (white), soft, nonplastic, and moist | | |
| 24.8 | 25.0 | Sandy Gravel, 10YR6/6 (brownish yellow), loose, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3-inch diameter. Sand is fine quartz grains | | |
| 25.0 | 25.7 | Silt, 10YR6/4 (light yellowish brown), soft, moderately plastic, and moist | | |
| 25.7 | 29.8 | Interbedded Silt with some Sand and slightly Clayey Silt, 10YR8/1 (white) with light 10YR7/6 (yellow) staining and mottling, moderately soft, slightly to moderately plastic, and moist | | |
| 29.8 | 30.0 | Sandy Gravel, 10YR6/6 (brownish yellow), loose, and moist. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.8-inch diameter. Sand is fine quartz grains | | |
| 30.0 | 30.5 | Sand, 7.5YR7/4 (pink), lightly consolidated, and moist. Sand is fine quartz grains | | |
| 30.5 | 33.1 | Sandy Gravel as at 29.8 to 30.0 ft | | |
| 33.1 | 34.4 | Sandy Gravel as above but with silt | | |

**211-A-021**

Plant North -2096.095, Plant East -5089.217 9/6/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 34.4 | 34.7 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is rounded to subangular chert with iron patina, 0.3- to 1.0-inch diameter. Sand is fine to medium quartz grains | | |
| 34.7 | 38.6 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist | | HU3 |
| 38.6 | 44.3 | Silt, 10YR8/2 (very pale brown) with light 10YR7/6 (yellow) laminations, soft, nonplastic, and soft | | |
| 44.3 | 45.1 | Clay, 10YR7/1 (light gray) with 10YR6/4 (light yellowish brown) mottling, moderately soft, plastic, and moist | | |
| 45.1 | 46.6 | Silt, 10YR7/3 (very pale brown), soft, nonplastic, and moist | | |
| 46.6 | 54.5 | Sand, 10YR8/2 (very pale brown) with some light 10YR7/6 (yellow) laminations, lightly consolidated, and moist. Sand is very fine grains | | |
| 54.5 | 54.7 | Sandy Gravel, 10YR6/3 (pale brown), loose, and moist. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter. Sand is very fine quartz grains | | |
| 54.7 | 55.0 | Sand as at 46.6 to 54.5 ft | | |
| 55.0 | 56.9 | Sand, 10YR7/6 (yellow) with light 10YR8/1 (white) mottling, lightly consolidated, and moist. Sand is fine quartz grains | | |
| 56.9 | 58.4 | Slightly Clayey Silt, 10YR8/2 (very pale brown) with light 10YR7/6 (yellow) laminations, moderately soft, slightly plastic, and moist | | |
| 58.4 | 59.9 | Sand, 10YR8/1 (white), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 59.9 | 62.4 | Silt, 10YR8/3 (very pale brown), soft, nonplastic, and moist | | |
| 62.4 | 65.8 | Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations and staining, firm, and moist. Sand is very fine grains | | HU4 |
| 65.8 | 66.0 | Gravelly Sand, 10YR8/1 (white), loose, and moist. Sand is fine quartz grains. Gravel is rounded chert with iron patina, 0.3- to 0.7-inch diameter | | |

**211-A-022**

Plant North -2095.823, Plant East -5058.897 9/27/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.5 | Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.8-inch diameter | | FILL |
| 2.5 | 5.5 | Silt, 10YR7/2 (light gray) with green tinge, moderately hard, nonplastic, and moist | | HU1 |
| 5.5 | 18.0 | Silt, 10YR7/2 (light gray) with 10YR7/6 (yellow) mottling, moderately soft to soft, nonplastic, and moist | | |
| 18.0 | 20.0 | Silt with Clay, 10YR8/2 (very pale brown) mottled with 10YR7/1 (light gray), moderately hard to hard, moderately plastic, and moist | | |
| 20.0 | 22.7 | Silt with some Clay, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), moderately hard, moderately plastic, and moist | | |
| 22.7 | 23.0 | Silty Gravel with Sand, 10YR4/4 (dark yellowish brown), firm, and moist. Gravel is subrounded chert without iron patina, 0.4- to 0.8-inch diameter. Sand is fine quartz grains | | HU2 |
| 23.0 | 23.2 | Silt, 10YR5/6 (yellowish brown), soft, nonplastic, and moist | | |
| 23.2 | 24.6 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 24.6 | 25.6 | Sandy Gravel, 10YR7/4 (very pale brown), dense, and moist. Gravel is subangular to subrounded chert without iron patina, 4-mm to 0.6-inch diameter. Sand is fine quartz grains | | |
| 25.6 | 26.6 | Sandy Gravel with Silt, 10YR6/6 (brownish yellow), dense, and moist. Gravel is subangular to subrounded chert without iron patina, 4-mm to 0.6-inch diameter. Sand is fine quartz grains | | |
| 26.6 | 30.8 | Silt with Sand, 10YR7/4 (very pale brown) mottled with 10YR8/4 (very pale brown), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 30.8 | 31.7 | Clay with Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) mottling and strong 2.5YR6/6 (light red) staining at 30.9 to 31.1 ft, moderately hard, moderately plastic, and moist | | |
| 31.7 | 32.6 | Silt, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), moderately soft, slightly plastic, and moist | | |
| 32.6 | 33.5 | Silt with Sand, 10YR8/2 (very pale brown), moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 33.5 | 35.2 | Sand, 10YR7/8 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 35.2 | 36.5 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 10YR7/6 (yellow), soft, moderately plastic, and moist | | |

**211-A-022**

Plant North -2095.823, Plant East -5058.897 9/27/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 36.5 | 46.1 | Silt, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) laminations, soft, nonplastic, and moist | | HU3 |
| 46.1 | 51.5 | Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 51.5 | 52.5 | Silt with little Gravel, 10YR8/2 (very pale brown) with light 2.5YR6/6 (light red) staining, soft, nonplastic, and moist. Gravel is rounded chert without iron patina, 0.4- to 0.6-inch diameter | | |
| 52.5 | 55.1 | Gravelly Sand, 10YR8/2 (very pale brown), lightly consolidated, and very moist. Sand is very fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 4-mm to 0.7-inch diameter | | |
| 55.1 | 56.0 | Sand, 10YR8/2 (very pale brown) with few 10YR7/6 (yellow) laminations, lightly consolidated, and wet. Sand is very fine quartz grains | | |
| 56.0 | 56.4 | Sand GRADING DOWN to poorly sorted Sandy Gravel, 10YR7/3 (very pale brown), firm, and wet. Sand is medium, rounded, quartz grains (above) and fine to medium, rounded, quartz grains (below). Gravel is rounded to subrounded chert without iron patina, 4-mm to 0.4-inch diameter. | | |
| 56.4 | 57.1 | Silt with some Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, slightly plastic, and moist | | |
| 57.1 | 58.3 | Silt, 10YR8/2 (very pale brown) with 10YR8/6 (yellow) laminations, soft, nonplastic, and moist | | |
| 58.3 | 59.3 | Sand, 10YR8/2 (very pale brown) with 7.5YR7/4 (pink) laminations, lightly consolidated, and wet. Sand is very fine quartz grains | | |
| 59.3 | 60.9 | Silt, 10YR8/2 (very pale brown), moderately soft, nonplastic, and moist | | |
| 60.9 | 63.6 | Sand, 10YR8/4 (very pale brown), firm, and wet. Sand is very fine quartz grains | | HU4 |
| 63.6 | 64.0 | Silt as 59.3 to 60.9 ft | | |
| 64.0 | 64.4 | Sandy Gravel, 7.5YR7/6 (reddish yellow), firm, and moist. Gravel is subrounded chert with iron patina, 4-mm to 0.5-inch diameter. Sand is very fine quartz grains | | HU5 |
| 64.4 | 67.7 | Sand, 10YR7/4 (very pale brown), firm, and wet. Sand is very fine quartz grains | | |
| 67.7 | 68.0 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and wet. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter. Sand is very fine to fine quartz grains | | |

**211-A-023**

Plant North -2096.132, Plant East -4994.506 9/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.0 | Concrete and subgrade gravel | | Fill |
| 2.0 | 5.0 | Silt, 10YR6/1 (gray) speckled with 10YR3/1 (very dark gray), firm, and dry to slightly moist | | HU1 |
| 5.0 | 10.0 | Silt, 10YR7/1 (light gray) mottled with 7.5YR7/8 (yellow), firm, nonplastic, and dry to slightly moist | | |
| 10.0 | 11.5 | Silt as above but soft and moist | | |
| 11.5 | 15.0 | Silt, 10YR7/1 (light gray) with some mottling by 10YR6/4 (light yellowish brown), firm, nonplastic, and slightly moist | | |
| 15.0 | 17.5 | Silt, 10YR7/2 (light gray), slightly soft, slightly plastic, and moist | | |
| 17.5 | 18.0 | Silty Sand with trace Gravel, 7.5YR6/8 (reddish yellow), slightly loose, and very moist. Sand is fine to medium quartz grains. Gravel is subangular chert with iron patina, 0.8-inch diameter | | |
| 18.0 | 20.0 | Clayey Sandy Silt, 7.5YR6/1 (gray) with some mottling by 7.5YR6/8 (reddish yellow), firm to very firm, and slightly moist | | |
| 20.0 | 26.0 | Clayey Gravelly Sand, 7.5YR6/8 (reddish brown), firm, and slightly moist. Sand ranges from fine to coarse grains. Gravel is subangular chert, 0.5-to 0.8-inch diameter | | HU2 |
| 26.0 | 28.0 | Silty Sand, 10YR7/2 (light gray), firm, and moist. Trace white chert gravel, 0.8-inch diameter | | |
| 28.0 | 30.5 | Clayey Sandy Silt, 7.5YR8/1 (white) with 7.5YR6/8 (reddish yellow) laminations, firm, and moist | | |
| 30.5 | 33.0 | Gravelly Silty Sand, 10YR6/8 (brownish yellow), firm, and slightly moist. Sand is fine to coarse, subangular, quartz grains. Gravel is subangular chert, 0.3- to 0.5-inch diameter | | |
| 33.0 | 36.2 | Silty Sand, 10YR7/1 (light gray), semi firm, and very moist. Sand is fine quartz grains | | |
| 36.2 | 40.0 | Silty Clay with little Sand, 7.5YR5/8 (strong brown) with slight mottling by 10YR7/1 (light gray), firm to stiff, very plastic, and slightly moist to moist | | HU3 |
| 40.0 | 45.0 | Clayey Silt, 10YR8/2 (very pale brown) mottled with 10YR6/8 (brownish yellow), soft to slightly soft, very plastic, and very moist. Trace fine quartz sand | | |
| 45.0 | 47.5 | Clayey Silt as above with trace of subrounded chert gravel, 0.2-inch diameter | | |
| 47.5 | 52.1 | Silty Clayey Sand, 10YR8/2 (very pale brown), soft, and very moist to slightly wet. Sand is very fine quartz grains | | |
| 52.1 | 53.1 | Silty Gravelly Sand, 10YR4/6 (dark yellowish brown), firm, and slightly moist. Gravel is subangular chert, 0.3-to 1.2-inch diameter | | |
| 53.1 | 55.2 | Silty Sand, 10YR5/3 (brown) mottled with 7.5YR6/8 (reddish yellow), firm, and slightly moist. | | |

**211-A-023**

Plant North -2096.132, Plant East -4994.506 9/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 55.2 | 57.5 | Silty Clay with trace Gravel, 10YR7/2 (very pale brown) mottled with 10YR6/8 (brownish yellow) | | |
| 57.5 | 58.0 | Gravelly Silty Clay, 10YR7/2 (very pale brown) mottled with 10YR6/8 (brownish yellow). Gravel is white, subrounded, chert | | |
| 58.0 | 61.9 | Silty Sand, 10YR7/1 (light gray), soft, and very moist to wet. Sand is very fine quartz grains | | |
| 61.9 | 62.5 | Sand, 10YR8/3 (very pale brown), firm to slightly loose, and wet. Sand is fine quartz grains | | HU4 |
| 62.5 | 64.9 | Sand as above but loose and saturated | | |
| 64.9 | 65.0 | Sand and Gravel. Gravel is chert, 0.2- to 0.4-inch diameter | | |

**211-A-024**

Plant North -2115.892, Plant East -5065.208 9/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.8 | Concrete residue from drilling through road bed | | FILL |
| 0.8 | 1.2 | Silt, 10YR6/1 (gray), hard, nonplastic, and dry | | |
| 1.2 | 2.1 | Gravelly Sand, 5YR7/8 (reddish yellow), loose, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 2.1 | 3.6 | Silt, 10YR7/1 (light gray), moderately soft, nonplastic, and slightly moist | | HU1 |
| 3.6 | 18.1 | Silt, 10YR8/2 (very pale brown) mottled with 10YR6/6 (brownish yellow), soft, nonplastic, and moist | | |
| 18.1 | 21.8 | Slightly Clayey Silt with trace Gravel, 10YR7/1 (light gray) with 10YR6/6 (brownish yellow) mottling, moderately hard, slightly to moderately plastic, and moist. Gravel is rounded chert without iron patina, 0.2-inch diameter | | |
| 21.8 | 23.9 | Gravelly Sand with Silt, 10YR7/4 (very pale brown), moderately dense/hard, and moist. Sand is 60% fine quartz grains and 40% coarse, subangular, chert grains. Gravel is subangular to rounded chert without iron patina or with light patina, 0.3- to 0.8-inch diameter | | HU2 |
| 23.9 | 25.1 | Sand, 10YR8/1 (white) with light 10YR7/6 (yellow) staining, firm, and moist. Sand is very fine quartz grains | | |
| 25.1 | 26.6 | Gravelly Sand, 10YR7/4 (very pale brown), loose, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.5- to 1.0-inch diameter | | |
| 26.6 | 30.1 | Clayey Silt with Gravel, 10YR7/1 (light gray) with little 10YR7/6 (yellow) mottling, moderately soft, moderately plastic, and moist. Gravel is subrounded to rounded chert without iron patina, 0.4- to 0.6-inch diameter | | |
| 30.1 | 31.0 | Silty Gravelly Sand, 7.5YR7/6 (reddish yellow), moderately dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.2- to 0.4-inch diameter | | |
| 31.0 | 31.4 | Sand, 7.5YR6/8 (reddish yellow), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 31.4 | 32.3 | Silt, 10YR8/1 (white), soft, nonplastic, and moist | | |
| 32.3 | 34.7 | Silty Sandy Gravel, 10YR7/3 (very pale brown), dense to moderately dense, and moist. Gravel is subrounded to subangular chert with light iron patina, 4-mm to 0.7-inch diameter. Sand is fine quartz grains | | |

**211-A-024**

Plant North -2115.892, Plant East -5065.208 9/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 34.7 | 39.3 | Slightly Clayey Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), very soft, moderately plastic, and moist | | HU3 |
| 39.3 | 46.3 | Silt, 10YR8/2 (very pale brown) with little 10YR7/6 (yellow) mottling, soft, slightly plastic, and moist | | |
| 46.3 | 48.6 | Silty Sand, 10YR8/2 (very pale brown), lightly consolidated, nonplastic, and very moist. Sand is very fine quartz grains | | |
| 48.6 | 51.9 | Sand, 10YR8/1 (white) with light 10YR7/6 (yellow) laminations, lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 51.9 | 52.9 | Gravelly Sand, 10YR7/6 (yellow), lightly consolidated to loose, and moist. Sand is very fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.5- to 0.6-inch diameter | | |
| 52.9 | 56.3 | Sand, 10YR7/3 (very pale brown) GRADING DOWN to 10YR7/6 (yellow) with few 5YR6/8 (reddish yellow) laminations, lightly consolidated, and very moist. Sand is fine quartz grains | | |
| 56.3 | 59.9 | Silt with Sand, 10YR8/2 (very pale brown), very soft, nonplastic, and very moist | | |
| 59.9 | 65.8 | Sand, 10YR8/3 (very pale brown) with some 10YR7/6 (yellow) laminations GRADING DOWN to 5YR6/6 (reddish yellow), lightly consolidated to loose, and wet. Sand is very fine quartz grains | | HU4 |
| 65.8 | 66.3 | Gravel, 10YR8/4 (very pale brown), loose, and wet. Gravel is subrounded to rounded chert with no iron patina or light iron patina, 0.2- to 0.5-inch diameter | | HU5 |
| 66.3 | 67.5 | Sand with Gravel, 7.5YR7/6 (reddish yellow), loose, and wet. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.2- to 0.5-inch diameter | | |

**211-A-025**

Plant North -2114.246, Plant East -5040.02 9/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.4 | Concrete residue from drilling through road bed | | FILL |
| 0.4 | 1.1 | Gravelly Silt, 10YR7/1 (light gray), loose/soft, nonplastic, and slightly moist. Gravel is subangular limestone, 0.3- to 0.5-inch diameter (dense gravel aggregate/DGA) | | |
| 1.1 | 2.0 | Sandy Gravel, 2.5YR5/4 (reddish brown), dense, and moist. Gravel is subrounded chert with iron patina, 0.2- to 0.6-inch diameter. Sand is fine quartz grains | | |
| 2.0 | 3.0 | Silt, 10YR7/1 (light gray) with green/blue tinge, moderately soft, nonplastic, and slightly moist | | HU1 |
| 3.0 | 17.3 | Silt, 10YR7/1 (light gray) mottled and stained with 10YR7/6 (yellow), soft, nonplastic, and moist | | |
| 17.3 | 21.5 | Slightly Clayey Silt, 10YR7/2 (light gray) with heavy mottling by 10YR7/6 (yellow), moderately hard, slightly plastic, and moist | | |
| 21.5 | 22.6 | Sandy Gravel, 10YR4/4 (dark yellowish brown), dense, and moist. Gravel is subangular to rounded chert with and without iron patina, 4-mm to 1.1-inch diameter. Sand is fine quartz grains | | HU2 |
| 22.6 | 23.0 | Sand, 5YR5/4 (reddish brown), firm, and moist. Sand is fine quartz grains | | |
| 23.0 | 23.5 | Silty Clay, 10YR7/3 (very pale brown), moderately soft, moderately plastic, and moist | | |
| 23.5 | 24.1 | Sandy Gravel as 21.5 to 22.6 ft | | |
| 24.1 | 24.4 | Sand, 10YR4/3 (brown), dense, and moist. Sand is poorly sorted, ranging from fine to coarse, rounded, quartz grains | | |
| 24.4 | 25.2 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 25.2 | 26.5 | Silty Sandy Gravel, 10YR7/3 (very pale brown), dense, and moist. Gravel is subangular to subrounded chert with and without iron patina, 0.2- to 0.6-inch diameter. Sand is 40% fine quartz grains and 60% coarse, angular, chert grains | | |
| 26.5 | 27.1 | Gravelly Sand, 7.5YR7/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 27.1 | 27.4 | Silt with Sand, 7.5YR8/4 (pink), moderately soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 27.4 | 30.0 | Silt with Sand, 10YR8/1 (white) with light 10YR7/6 (yellow) mottling GRADING DOWN to 10YR7/1 (light gray), moderately soft to soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 30.0 | 33.5 | Sand, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |

**211-A-025**

Plant North -2114.246, Plant East -5040.02 9/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 33.5 | 34.4 | Silty Gravelly Sand with blebs of Clay, 10YR6/4 (light yellowish brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.2- to 0.4-inch diameter | | |
| 34.4 | 35.6 | Sand, 10YR6/6 (brownish yellow), firm, and moist. Sand is very fine quartz grains | | |
| 35.6 | 40.0 | Slightly Clayey Silt, 7.5YR6/6 (reddish yellow) with 7.5YR8/1 (white) mottling, soft, moderately plastic, and moist | | HU3 |
| 40.0 | 42.2 | Slightly Clayey Silt, 10YR8/2 (very pale brown) with light 10YR7/6 (yellow) mottling, soft, moderately plastic, and moist | | |
| 42.2 | 44.7 | Slightly Clayey Silt, 5YR7/2 (pinkish gray), soft, moderately plastic, and moist | | |
| 44.7 | 45.0 | Sand, 7.5YR7/2 (pinkish gray), firm, and moist. Sand is very fine quartz grains | | |
| 45.0 | 49.3 | Interbedded slightly Clayey Silt and Silt, 10YR8/1 (white) with some 10YR7/6 (yellow) mottling, soft, slightly to moderately plastic, and moist | | |
| 49.3 | 55.0 | Sand, 10YR8/1 (white), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 55.0 | 56.6 | Sand with trace Gravel, 10YR8/4 (very pale brown) with 10YR6/6 (brownish yellow) laminations from 55.6 to 56.6 ft, firm, and moist. Sand is very fine quartz grains. Gravel is subrounded to rounded chert without iron patina, 0.2- to 0.4-inch diameter | | |
| 56.6 | 57.9 | Silty Clay, 7.5YR7/2 (pinkish gray) with 7.5YR6/6 (reddish yellow) mottling, moderately hard, moderately plastic, and moist | | |
| 57.9 | 61.9 | Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) staining and laminations, soft, nonplastic, and moist | | |
| 61.9 | 65.0 | Sand, 10YR8/1 (white) with 10YR7/6 (yellow) and 10YR6/6 (brownish yellow) laminations, firm, and very moist. Sand is very fine quartz grains | | HU4 |
| 65.0 | 65.2 | Gravelly Sand, 10YR8/3 (very pale brown), loose, and wet. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.2- to 0.4-inch diameter | | HU5 |

**211-A-026**

Plant North -2131.264, Plant East -5088.823 9/7/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.0 | Silty Gravel, 10YR7/1 (light gray), loose, and slightly moist. Gravel is subangular to subrounded limestone (dense gravel aggregate/DGA), 4 mm- to 0.3-inch diameter | | Fill |
| 1.0 | 1.7 | Silty Gravel as 0.0 to 1.0 ft but moist | | |
| 1.7 | 2.1 | Silty Sandy Gravel, 2.5YR5/4 (reddish brown), dense, and moist. Gravel is subrounded chert with iron patina, 4 mm- to 0.4-inch diameter. Sand is fine quartz grains. | | |
| 2.1 | 3.0 | Silt, 10YR7/1 (light gray), hard, nonplastic, and slightly moist | | HU1 |
| 3.0 | 15.0 | Silt, 10YR7/2 (light gray) mottled with 10YR6/6 (brownish yellow), soft, nonplastic, and moist | | |
| 15.0 | 16.3 | Silt as 3.0 to 15.0 ft but colored 10YR7/3 (very pale brown) | | |
| 16.3 | 22.3 | Clayey Silt with some Gravel, 10YR7/4 (very pale brown) with little 10YR7/1 (light gray) mottling GRADING DOWN to 10YR6/2 (light brownish gray), moderately hard, slightly plastic, and moist. Gravel is rounded to subrounded chert without iron patina, 0.2-inch diameter | | |
| 22.3 | 23.0 | Gravelly Sand, 7.5YR6/6 (reddish yellow), firm to dense, and moist. Sand is predominately fine quartz grains but includes some coarse, rounded, quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.2- to 0.4-inch diameter | | HU2 |
| 23.0 | 24.2 | Silt, 10YR8/2 (very pale brown) with 10YR6/6 (brownish yellow) mottling/laminations, moderately soft, slightly plastic, and moist | | |
| 24.2 | 26.0 | Sandy Gravel, 7.5YR6/6 (reddish yellow), dense, and moist. Gravel is subrounded to subangular chert with iron patina, 0.2- to 0.8-inch diameter. Sand is fine quartz grains | | |
| 26.0 | 29.8 | Interbedded Clayey Silt, moderately soft, plastic, and moist AND Sandy Silt, soft, nonplastic, and moist. Both are colored 10YR8/1 (white) mottled/laminated with 10YR7/6 (yellow) | | |
| 29.8 | 30.6 | Sand, 10YR8/4 (very pale brown), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 30.6 | 33.5 | Gravelly Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.3-inch diameter | | |
| 33.5 | 36.0 | Gravelly Sand as 30.6 to 33.5 ft but with Silt | | |
| 36.0 | 44.2 | Slightly Clayey Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), very soft, slightly plastic, and moist | | |

**211-A-026**

Plant North -2131.264, Plant East -5088.823 9/7/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 44.2 | 45.0 | Silt, 7.5YR7/2 (pinkish gray) with 7.5YR7/4 (pink) mottling, soft, plastic, and moist | | HU3 |
| 45.0 | 49.9 | Slightly Clayey Silt as 36.0 to 44.2 ft. Includes little 10YR3/1 (very dark gray) blebs (manganese?) | | |
| 49.9 | 51.5 | Sand, 7.5YR8/4 (pink), loosely consolidated, and moist. Sand is fine quartz grains | | |
| 51.5 | 51.8 | Sand, 7.5YR8/4 (pink), firm, and moist. Sand is medium, rounded, quartz grains GRADING DOWN to mix of medium, rounded, quartz grains and very coarse, subangular, chert grains | | |
| 51.8 | 52.7 | Sand, 10YR8/2 (very pale brown), lightly consolidated, and wet. Sand is very fine quartz grains | | |
| 52.7 | 53.1 | Gravelly Sand, 10YR8/4 (very pale brown), loose, and moist. Sand is a mix of fine quartz grains and coarse, subangular, chert grains. Gravel is rounded to subrounded chert without iron patina, 4 mm- to 0.4-inch diameter | | |
| 53.1 | 55.1 | Sand, 10YR8/2 (very pale brown), lightly consolidated, and very moist. Sand is very fine quartz grains | | |
| 55.1 | 55.5 | Sand, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) staining, firm, and moist. Sand is fine quartz grains | | |
| 55.5 | 56.4 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is rounded to subangular chert without iron patina, 0.2- to 0.8-inch diameter. Sand is equal portions of fine and medium, rounded, quartz grains | | |
| 56.4 | 61.4 | Silt, 10YR8/3 (very pale brown) with light 10YR7/6 (yellow) laminations, soft, slightly plastic, and moist | | |
| 61.4 | 66.1 | Sand, 10YR7/6 (reddish yellow), loose, and wet. Sand is fine quartz grains | | HU4 |
| 66.1 | 66.5 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is subrounded to subangular chert with iron patina, 0.2- to 1.0-inch diameter. Sand is fine quartz grains | | |

**211-A-027**

Plant North -2125.771, Plant East -4995.046 9/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.7 | Silty dark brown soil over Gravel and Sand, white to medium gray. Gravel is limestone. Sand is coarse grains. | | Fill |
| 1.7 | 5.0 | Silt, 10YR8/1 (white), soft, and dry | | HU1 |
| 5.0 | 8.5 | Silt, 10YR7/1 (light gray) speckled with 10YR8/4 (very pale brown), firm, and moist | | |
| 8.5 | 10.0 | Silt, 7.5YR7/1 (light gray), soft to very soft, slightly plastic, and very moist | | |
| 10.0 | 12.5 | Permeameter sample - no description | | |
| 12.5 | 15.0 | Silt, 10YR7/1 (light gray), soft, nonplastic, and moist | | |
| 15.0 | 16.1 | Silt with Sand, 10YR6/6 (brownish yellow), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 16.1 | 17.5 | Silty Gravelly Sand, 10YR5/4 (yellowish brown), moderately loose, and moist. Sand is 70% fine quartz grains and 30% coarse, subrounded, chert grains. Gravel is subrounded chert with iron patina, 0.3-inch diameter | | |
| 17.5 | 19.6 | Silt with Clay, 10YR6/2 (light brownish gray), hard, slightly to moderately plastic, and slightly moist | | |
| 19.6 | 20.0 | Sandy Gravel, 10YR6/6 (brownish yellow), dense, and moist. Gravel is rounded to subrounded chert without iron patina, 0.3- to 1.0-inch diameter. Sand is fine quartz grains | | HU2 |
| 20.0 | 21.0 | Silt, 10YR5/3 (brown), very soft, moderately plastic, and very moist | | |
| 21.0 | 22.0 | Sandy Gravel, 7.5YR6/6 (reddish yellow), dense, and moist. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.4-inch diameter. Sand is fine quartz grains | | |
| 22.0 | 24.5 | Permeameter sample - no description | | |
| 24.5 | 25.0 | Sand Gravel as 21.0 to 22.0 ft but gravel ranges up to 0.8-inch diameter | | |
| 25.0 | 26.2 | Sandy Gravel, 10YR5/4 (yellowish brown), dense, and moist. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.7-inch diameter. Sand is fine quartz grains | | |
| 26.2 | 27.2 | Silt with Clay and some Gravel, 10YR7/1 (light gray), hard, moderately plastic, and slightly moist. Gravel is subrounded to rounded chert without iron patina, mostly 0.3-inch diameter but some 0.8- to 1.0-inch diameter | | |
| 27.2 | 28.6 | Silty Gravelly Sand, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 28.6 | 28.9 | Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist | | |

**211-A-027**

Plant North -2125.771, Plant East -4995.046 9/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 28.9 | 30.5 | Slightly Clayey Silt, 10YR7/1 (light gray) with 10YR7/6 (yellow) mottling, hard, slightly plastic, and slightly moist | | |
| 30.5 | 32.0 | Silty Sand, 10YR7/8 (yellow) with 10YR7/1 (light gray) mottling, firm/moderately soft, (nonplastic), and moist. Sand is very fine quartz grains | | |
| 32.0 | 34.1 | Silty Sandy Gravel, 7.5YR6/6 (reddish yellow), dense, and moist. Gravel is subangular to subrounded chert without iron patina or with light iron patina, 4 mm- to 0.5-inch diameter. Sand is 80% fine quartz grains and 20% coarse, subangular, chert grains | | |
| 34.1 | 35.0 | Sandy Gravel, 7.5YR6/8 (reddish yellow), dense, and moist. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.5-inch diameter. Sand is 80% fine quartz grains and 20% coarse, subangular, chert grains | | |
| 35.0 | 35.3 | SLOUGH: Silt, 10YR5/4 (yellowish brown), very soft, nonplastic, and very moist | | |
| 35.3 | 37.5 | Sandy Gravel as 34.1 to 35.0 ft but gravel ranges up to 0.8-inch diameter | | |
| 37.5 | 40.0 | Permeameter sample - no description | | No Description |
| 40.0 | 43.9 | Silt, 10YR8/3 (very pale brown) with little 10YR8/1 (white) mottling, soft, moderately plastic, and moist | | HU3 |
| 43.9 | 44.7 | Sand, 10YR8/1 (white) with 10YR7/6 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 44.7 | 47.4 | Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | |
| 47.4 | 49.7 | Silt with some Clay, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, moderately soft to soft, plastic, and moist | | |
| 49.7 | 53.2 | Sand with some Gravel, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, lightly consolidated, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 53.2 | 60.1 | Sand interbedded with Clayey Silt, 10YR8/1 (white) with 10YR7/6 (yellow) laminations and staining and some 2.5YR7/8 (light red) blebs, moist. Sand is lightly consolidated, fine, quartz grains. Clayey Silt is soft and moderately plastic | | |
| 60.1 | 66.2 | Sand, 10YR8/4 (very pale brown) with some 10YR7/6 (yellow) laminations, loose, and wet. Sand is fine quartz grains | | |

**211-A-027**

Plant North -2125.771, Plant East -4995.046 9/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 66.2 | 67.5 | Sandy Gravel, 10YR6/6 (brownish yellow), loose, and wet. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 1.0-inch diameter. Sand is 85% fine quartz grains and 15% medium, rounded, quartz grains | | HU4 |

**211-A-028**

Plant North -2048.759, Plant East -5231.166 9/24/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.4 | Silt, 10YR6/3 (pale brown), soft, nonplastic, and slightly moist. Zone of roots and humic material | | HU1 |
| 0.4 | 3.7 | Silt, 10YR8/2 (very pale brown) with little 10YR6/6 (brownish yellow) mottling, soft (crumbles to powder), nonplastic, and moist GRADING DOWN to dry | | |
| 3.7 | 16.4 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, slightly plastic, and moist | | |
| 16.4 | 18.0 | Gravelly Sand, 7.5YR6/4 (light brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular chert with iron patina, 0.3- to 0.6-inch diameter | | HU2 |
| 18.0 | 18.7 | Sand, 7.5YR6/4 (light brown), firm, and moist. Sand is fine to medium, subrounded, quartz grains | | |
| 18.7 | 20.2 | Silt, 7.5YR7/1 (light gray) mottled with 7.5YR7/6 (reddish yellow), moderately soft, moderately plastic, and moist | | |
| 20.2 | 20.5 | Gravelly Sand, 7.5YR7/3 (pink), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3-inch diameter | | |
| 20.5 | 20.9 | Sand, 10YR7/4 (pink), firm, and moist. Sand is very fine quartz grains | | |
| 20.9 | 21.4 | Gravelly Sand as 20.2 to 20.5 ft | | |
| 21.4 | 23.1 | Sandy Gravel, 7.5YR7/3 (pink), dense, and moist. Gravel is subangular chert without iron patina, 0.3-to 0.6-inch diameter. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Note: 20.5 to 23.1 ft is a coarsening downward sequence | | |
| 23.1 | 23.6 | Silty Sand with little Gravel, 10YR7/3 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded to rounded chert without iron patina, 0.4- to 0.5-inch diameter | | |
| 23.6 | 25.1 | Sand with Gravel, 10YR6/3 (pale brown), dense, and moist. Sand is 80% fine quartz grains and 20% coarse to very coarse, subrounded, chert grains. Gravel is subrounded chert without iron patina, 0.3-inch diameter | | |
| 25.1 | 25.6 | Sand with Gravel as 23.6 to 25.1 ft but sand is medium, subrounded, quartz grains | | |
| 25.6 | 28.3 | Sand with little Gravel, 7.5YR7/4 (pink), firm, and moist. Sand is fine quartz grains. Gravel is subangular chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 28.3 | 28.6 | Sandy Gravel, 7.5YR7/4 (pink), dense, and moist. Gravel is subrounded to rounded chert without iron patina, 4 mm - to 0.4-inch diameter | | |

**211-A-028**

Plant North -2048.759, Plant East -5231.166 9/24/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 28.6 | 31.4 | Sand with some Gravel, 10YR7/4 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert without iron patina, 0.6 to 0.8-inch diameter | | |
| 31.4 | 35.0 | Sandy Gravel, 10YR6/6 (brownish yellow), dense, and moist. Gravel is subrounded to subangular chert without iron patina, 4 mm- to 1.0-inch diameter. Sand is 80% fine quartz grains and 20% coarse to very coarse, subrounded, chert grains | | |
| 35.0 | 35.5 | Silty Clay, 7.5YR7/3 (pink), soft, plastic, and moist | | HU3 |
| 35.5 | 35.7 | Silty Sand, 7.5YR7/3 (pink), lightly consolidated, and moist. Sand is fine quartz grains | | |
| 35.7 | 36.6 | Slightly Clayey Silt, 7.5YR8/2 (pinkish white), soft, plastic, and moist | | |
| 36.6 | 36.8 | Silty Sand as 35.5 to 35.7 ft | | |
| 36.8 | 39.9 | Silt, 2.5YR7/1 (light reddish gray), soft, moderately plastic, and moist | | |
| 39.9 | 43.1 | Silt with Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 43.1 | 44.6 | Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, moderately hard, slightly to moderately plastic, and moist | | |
| 44.6 | 46.0 | Clay with Silt, 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately soft, moderately plastic, and moist | | |
| 46.0 | 48.0 | Silt, 10YR7/4 (very pale brown) with some 10YR8/1 (white) mottling, soft, nonplastic, and moist | | |
| 48.0 | 50.9 | Sand, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 50.9 | 52.4 | Silt with little Clay, 7.5YR7/4 (pink) with light 7.5YR7/1 (light gray) mottling, soft, plastic, and moist | | |
| 52.4 | 54.4 | Silty Sand, 10YR7/6 (yellow) with 10YR8/1 (white) mottling, firm, and moist. Sand is very fine quartz grains | | |
| 54.4 | 55.5 | Sandy Gravel, 7.5YR6/6 (reddish yellow), firm, and moist. Gravel is rounded to subangular chert without iron patina, 0.3- to 1.0-inch diameter. Sand is very fine quartz grains | | |
| 55.5 | 55.9 | Sand, 7.5YR6/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | |
| 55.9 | 60.0 | Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft, slightly plastic, and moist | | |
| 60.0 | 61.3 | Sand, 10YR8/1 (white), loose to lightly consolidated, and wet. Sand is very fine quartz grains | | |

**211-A-028**

Plant North -2048.759, Plant East -5231.166 9/24/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 61.3 | 62.1 | Gravelly Sand, 10YR8/1 (white), firm, and wet. Sand is fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 0.4- to 1.0-inch diameter | | HU4 |
| 62.1 | 62.5 | Gravelly Sand, 10YR7/6 (yellow), loose, and wet. Sand is fine to medium, rounded, quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.8- to 1.0-inch diameter | | |

**211-A-029**

Plant North -2066.748, Plant East -5214.094 9/25/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.4 | Silt, 10YR5/2 (grayish brown), soft (noncohesive), nonplastic, and dry. Zone or roots and humic material | | |
| 0.4 | 3.8 | Silt, 10YR8/2 (very pale brown) with little 10YR7/6 (yellow) mottling, moderately hard, nonplastic, and dry | | HU1 |
| 3.8 | 16.3 | Silt, 10YR7/2 (light gray) mottled with 10YR7/6 (yellow), soft, slightly plastic, and moist | | |
| 16.3 | 17.0 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 17.0 | 19.2 | Sand with little Gravel, 7.5YR6/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains. Gravel is rounded to subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 19.2 | 21.7 | Silt, 10YR8/2 (very pale brown) mottled with10YR7/4 (very pale brown), moderately hard, nonplastic to slightly plastic, and moist | | |
| 21.7 | 23.3 | Silt with some Gravel and little Clay, 10YR8/2 (very pale brown) mottled with10YR7/4 (very pale brown), moderately hard, plastic, and moist. Gravel is rounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 23.3 | 25.5 | Gravelly Sand, 7.5YR6/4 (light brown), dense, and moist. Sand is 70% fine quartz grains and 30% coarse to very coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.4-inch diameter | | |
| 25.5 | 28.9 | Sand GRADING DOWN to Sand with Gravel, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) staining, lightly consolidated to firm, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.4- to 0.5-inch diameter | | HU2 |
| 28.9 | 29.6 | Silt with some Clay and little Gravel, 10YR7/2 (light gray), soft, plastic, and moist. Gravel is subangular chert with iron patina, 0.4- to 0.6-inch diameter | | |
| 29.6 | 29.9 | Sandy Silt with little Gravel, 10YR7/2 (light gray), soft, nonplastic, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 29.9 | 32.6 | Gravelly Sand, 7.5YR7/4 (pink), dense, and moist. Sand is 70% fine quartz grains and 30% coarse to very coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, mostly 0.3-inch diameter but some 0.7- to 1.0-inch diameter | | |
| 32.6 | 34.0 | Sand, 7.5YR7/4 (pink), lightly consolidated, and moist. Sand is very fine quartz grains | | |

**211-A-029**

Plant North -2066.748, Plant East -5214.094 9/25/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 34.0 | 35.3 | Gravelly Sand with Silt, 7.5YR5/6 (strong brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3-to 0.6-inch diameter | | |
| 35.3 | 40.0 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/4 (very pale brown), soft, plastic, and moist | | HU3 |
| 40.0 | 42.5 | Silt with Sand, 7.5YR8/3 (pink) with some 7.5YR7/6 (reddish yellow) laminations, soft, moderately plastic, and moist. Sand is very fine quartz grains | | |
| 42.5 | 48.1 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic to plastic, and moist | | |
| 48.1 | 49.9 | Sand with Silt, 10YR7/4 (very pale brown) mottled with 10YR8/2 (very pale brown), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 49.9 | 52.1 | Sand, 10YR8/1 (white) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine to fine quartz grains | | |
| 52.1 | 56.9 | Sandy Gravel, 10YR8/2 (very pale brown), lightly consolidated, and moist. Gravel is subrounded chert without iron patina, 0.3- to 0.6-inch diameter. Sand is fine quartz grains | | |
| 56.9 | 60.0 | Clay with Silt, 10YR8/2 (very pale brown) with 10YR8/4 (very pale brown) laminations, soft, plastic, and moist | | |
| 60.0 | 62.3 | Silt, 10YR8/2 (very pale brown), soft, moderately plastic, and moist | | |
| 62.3 | 63.1 | Sand, interbedded 10YR8/1 (white) and 10YR8/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | HU4 |
| 63.1 | 63.6 | Silt, 10YR8/4 (very pale brown), soft, nonplastic, and moist | | |
| 63.6 | 64.0 | Sand, 10YR7/6 (yellow), loose, and wet. Sand is very fine quartz grains | | |
| 64.0 | 65.0 | Sandy Gravel, 10YR7/6 (yellow), stained 10YR6/2 (light brownish gray) at 64.8 to 65.0 ft (manganese?), loose, and wet. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.8-inch diameter. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains | | HU5 |

**211-A-030**

Plant North -2027.362, Plant East -5204.628 9/25/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 5.0 | No recovery | | Missing |
| 5.0 | 18.6 | Silt, 10YR7/2 (light gray) with 10YR7/4 (very pale brown) mottling and a few 10YR3/1 (very dark gray) blebs (manganese?), soft, nonplastic, and moist | | HU1 |
| 18.6 | 21.2 | Clay with Silt and some Gravel, 10YR7/2 (light gray) with 10YR6/8 (brownish yellow) mottling, moderately hard, plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.4- to 0.5-inch diameter | | |
| 21.2 | 22.7 | Silty Sand with Gravel, 10YR7/2 (light gray), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.5-inch diameter | | HU2 |
| 22.7 | 24.0 | Sandy Gravel, 7.5YR6/6 (reddish yellow), dense, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.5-inch diameter. Sand is 70% fine quartz grains and 30% coarse to very coarse, subangular, chert grains. Suspect DNAPL presence based on PID trend and distinct smell | | |
| 24.0 | 25.1 | Silty Gravelly Sand, 7.5YR6/6 (reddish yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.4- to 0.7-inch diameter | | |
| 25.1 | 26.2 | Sand with little Gravel, 7.5YR7/4 (pink), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.3-inch diameter | | |
| 26.2 | 27.6 | Interbedded Silt and Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations. Silt is soft, nonplastic, and moist. Sand is very fine quartz grains, lightly consolidated, and moist | | |
| 27.6 | 28.9 | Sand, 10YR8/2 (very pale brown) mottled with 10YR6/6 (brownish yellow), lightly consolidated, and moist. Sand is 90% fine quartz grains and 10% coarse, rounded, chert grains | | |
| 28.9 | 31.0 | Gravelly Sand, 10YR7/4 (very pale brown), dense, and moist. Sand is 80% fine quartz grains and 20% coarse to very coarse, subangular, chert gains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 31.0 | 31.8 | Sand with little Gravel, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.4- to 0.6-inch diameter | | |
| 31.8 | 32.7 | Silty Gravelly Sand as 24.0 to 25.1 ft | | |

**211-A-030**

Plant North -2027.362, Plant East -5204.628 9/25/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 32.7 | 33.9 | Silt GRADING DOWN to Silt with Sand, 7.5YR7/1 (light gray) mottled with 7.5YR6/6 (reddish yellow), soft, moderately plastic to nonplastic, and moist. Sand is very fine quartz grains | | |
| 33.9 | 35.5 | Gravelly Sand as 28.9 to 31.0 ft | | |
| 35.5 | 37.5 | Silt, 10YR7/3 (very pale brown), soft, slightly plastic, and moist | | HU3 |
| 37.5 | 39.9 | Silt with Sand, 10YR8/2 (very pale brown), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 39.9 | 45.0 | Clayey Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately hard, moderately plastic, and moist | | |
| 45.0 | 48.4 | Silt, 7.5YR7/6 (reddish yellow) with little 7.5YR8/1 (white) mottling, moderately hard, slightly plastic, and moist | | |
| 48.4 | 49.5 | Silt, 7.5YR8/1 (white) with 7.5YR7/8 (reddish yellow) mottling, soft, nonplastic, and moist | | |
| 49.5 | 50.5 | Sand, 10YR8/2 (very pale brown), firm to dense, and moist. Sand is very fine quartz grains | | |
| 50.5 | 53.1 | Slightly Clayey Silt, 7.5YR8/2 (pinkish white) with some 7.5YR7/8 (reddish yellow) mottling, soft, plastic, and moist | | |
| 53.1 | 54.9 | Sand with little Gravel, 10YR8/1 (white), lightly consolidated, and moist. Sand is 90% fine quartz grains and 10% coarse, rounded, chert grains. Gravel is rounded chert without iron patina, 0.5- to 1.0-inch diameter | | |
| 54.9 | 55.4 | Sandy Gravel, 10YR8/1 (white), loose, and moist. Gravel is subangular to subrounded chert without iron patina, 0.3- to 1.0-inch diameter. Sand is fine quartz grains | | |
| 55.4 | 56.4 | Sand, 10YR8/4 (very pale brown), loose, and wet. Sand is very fine quartz grains | | |
| 56.4 | 57.8 | Silt, 7.5YR8/4 (pink) with some 7.5YR7/6 (reddish yellow) laminations, soft, slightly plastic, and moist | | |
| 57.8 | 61.5 | Sand, 10YR8/1 (white), lightly consolidated, and moist. Sand is very fine quartz grains | | HU4 |
| 61.5 | 65.0 | Gravelly Sand, 10YR7/6 (yellow), loose, and wet. Sand is fine to medium, rounded, quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.4- to 0.7-inch diameter | | |

**211-A-031**

Plant North -2136.286, Plant East -5040.074 9/26/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.5 | Sand with Gravel, 2.5YR6/8 (light red), loose, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3-inch diameter | | Fill |
| 0.5 | 4.6 | Silt, 10YR7/1 (light gray) with bluish tinge, soft, nonplastic, and moist (suspected fill material) | | |
| 4.6 | 20.0 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist | | HU1 |
| 20.0 | 20.7 | Clay with some Silt and some Gravel, 10YR7/2 (light gray) with some 10YR7/6 (yellow) mottling, moderately hard, plastic, and moist. Gravel is subrounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 20.7 | 22.7 | Silty Gravelly Sand, 7.5YR5/6 (strong brown) GRADING DOWN to 7.5YR7/6 (reddish yellow), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subangular, chert grains. Gravel is subangular to subrounded chert without iron patina, 0.3- to 1.0-inch diameter | | HU2 |
| 22.7 | 24.2 | Silt, 10YR7/1 (light gray), moderately soft, moderately plastic, and moist | | |
| 24.2 | 25.6 | Gravelly Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.8-inch diameter | | |
| 25.6 | 28.1 | Sandy Gravel with some Silt, 7.5YR6/4 (light brown), dense, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.6-inch diameter. Sand is 60% fine quartz grains and 40% coarse-to-very-coarse, subangular, chert grains | | |
| 28.1 | 30.8 | Sand with some Gravel, firm-to-dense, and moist. Sand is very fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 30.8 | 32.5 | Silty Gravel with Sand, 7.5YR6/4 (light brown), dense, and moist. Gravel is subangular to subrounded chert without iron patina, 0.3- to 1.0-inch diameter. Sand is 80% fine quartz grains and 20% coarse, rounded, chert grains | | |
| 32.5 | 33.3 | Silt with some Gravel and little Clay, 10YR6/4 (light yellowish brown) mottled with 10YR8/1 (white), moderately soft, slightly plastic, and moist | | |
| 33.3 | 36.2 | Silty Sand with Gravel, 10YR7/4 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert without iron patina, 0.4- to 0.7-inch diameter | | |
| 36.2 | 38.3 | Clayey Silt, 7.5YR7/4 (pink) with 7.5YR7/2 (pinkish gray) mottling, moderately hard, plastic, and moist | | |

**211-A-031**

Plant North -2136.286, Plant East -5040.074 9/26/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 38.3 | 42.5 | Silt GRADING DOWN to Silt with Sand, 7.5YR7/1 (light gray) with 7.5YR7/4 (pink) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | HU3 |
| 42.5 | 44.1 | Sand, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 44.1 | 45.3 | Silt with little Clay, 10YR7/4 (very pale brown) with 10YR7/1 (light gray) mottling, soft, plastic, and moist | | |
| 45.3 | 48.2 | Silt, 10YR7/4 (very pale brown) with mottling by 10YR7/6 (yellow) and 2.5YR6/6 (light red) (2.5YR6/6 prominent from 46.8 to 47.4 ft), soft, slightly plastic, and moist | | |
| 48.2 | 51.0 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains GRADING Down to fine quartz grains. Note: 0.05-ft horizon of 10YR3/1 (very dark gray) staining at 48.8 ft (manganese?) | | |
| 51.0 | 53.4 | Sand with Gravel interbedded with Sandy Gravel, 10YR8/3 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel ranges from subangular chert with 0.3-inch diameter to rounded chert without iron patina, 0.5-inch diameter | | |
| 53.4 | 54.2 | Sand, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) laminations, firm, and wet. Sand is very fine quartz grains | | |
| 54.2 | 55.1 | Sand with Gravel, 10YR7/3 (very pale brown), firm-to-dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert trains. Gravel is subrounded chert without iron patina, 4 mm- to 0.3-inch diameter | | |
| 55.1 | 55.6 | Sand as at 53.4 to 54.2 ft but without laminations. Sand is very fine quartz grains | | |
| 55.6 | 56.2 | Sand with Gravel as at 54.2 to 55.1 ft | | |
| 56.2 | 56.6 | Sand, 10YR7/6 (yellow), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 56.6 | 57.0 | Clayey Silt, 10YR8/2 (very pale brown), moderately hard, moderately plastic, and moist | | |
| 57.0 | 58.1 | Silt, 10YR8/3 (very pale brown), moderately soft, slightly plastic, and moist | | |
| 58.1 | 59.9 | Sand, 10YR8/1 (white) with 10YR7/6 (yellow) laminations, slightly consolidated, and moist. Sand is very fine quartz grains | | |
| 59.9 | 60.7 | Clayey Silt as at 56.6 to 57.0 ft | | |
| 60.7 | 66.0 | Sand, 10YR8/4 (very pale brown), lightly consolidated to loose, and wet. Sand is very fine quartz grains. Note: 65.0 to 66.0 ft appears to be 'flowing sand' - no structure. | | HU4 |

**211-A-031**

Plant North -2136.286, Plant East -5040.074 9/26/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 66.0 | 66.0 | Subrounded chert Gravel without iron patina, 0.4- to 1.0-inch diameter | | HU5 |

**211-A-032**

Plant North -1999.905, Plant East -5031.516 9/28/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.2 | Silt, 10YR4/1 (dark gray), soft (loose), nonplastic, and moist. Zone of roots and humic material | | HU1 |
| 0.2 | 1.5 | Silt, 10YR6/3 (pale brown), soft, nonplastic, and moist | | |
| 1.5 | 4.0 | Silt, 10YR7/2 (light gray), soft, nonplastic, and moist | | |
| 4.0 | 5.5 | Silt, 10YR7/1 (light gray), moderately hard, nonplastic, and dry | | |
| 5.5 | 19.8 | Silt, 10YR7/2 (light gray) with 7.5YR7/6 (reddish yellow) mottling, soft, nonplastic, and moist | | |
| 19.8 | 20.6 | Silty Sand with Gravel, 10YR7/4 (pink), dense, and moist. Sand is fine quartz grains. Gravel is subangular to rounded chert, with and without iron patina, 0.3- to 0.5-inch diameter | | |
| 20.6 | 21.1 | Silty Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |
| 21.1 | 22.6 | Silty Sandy Gravel, 7.5YR7/4 (pink) with little 7.5YR8/1 (white) mottling, dense, and moist. Gravel is subangular to rounded chert with iron patina, 4 mm- to 0.8-inch diameter. Sand is 70% fine quartz grains and 30% coarse, rounded, chert grains | | HU2 |
| 22.6 | 23.8 | Silt, 10YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow) GRADING DOWN to 10YR8/1 (white), moderately soft, moderately plastic, and moist | | |
| 23.8 | 25.0 | Sand, 10YR8/3 (very pale brown) mottled with 10YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 25.0 | 25.2 | Silt with Gravel, 7.5YR7/1 (light gray), soft, plastic, and moist. Gravel is subrounded chert with iron patina, 0.4- to 1.0-inch diameter | | |
| 25.2 | 25.6 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 25.6 | 30.5 | Silt, 10YR8/1 (white) with 10YR7/6 (yellow) mottling and staining, soft, nonplastic, and moist | | |
| 30.5 | 31.6 | Silt with little Gravel, 10YR7/1 (light gray), soft, nonplastic, and moist. Gravel is subrounded chert without iron patina, 1.0-inch diameter | | |
| 31.6 | 33.2 | Gravelly Sand, 10YR8/3 (very pale brown) mottled with 10YR8/1 (white), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 33.2 | 34.3 | Sandy Gravel with Silt, 10YR7/4 (very pale brown) GRADING DOWN to 10YR7/2 (light gray), dense, and moist. Gravel is subangular chert with iron patina, 4 mm- to 1.0-inch diameter. Sand is fine quartz grains | | |

**211-A-032**

Plant North -1999.905, Plant East -5031.516 9/28/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 34.3 | 35.1 | Sand with Gravel, 10YR7/4 (very pale brown), loose, and wet. Sand is very fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.7-inch diameter | | |
| 35.1 | 37.9 | Clay with some Silt, 7.5YR7/4 (pink) GRADING DOWN to 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, plastic, and moist | | HU3 |
| 37.9 | 38.3 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 38.3 | 47.6 | Silt with some Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately hard, slightly to moderately plastic, and moist | | |
| 47.6 | 50.0 | Silt, 10YR7/6 (yellow) with some 10YR8/1 (white) mottling, soft to moderately soft, nonplastic, and moist | | |
| 50.0 | 54.6 | Silt with Clay, 10YR8/1 (white) with some 7.5YR7/4 (pink) mottling GRADING DOWN to 7.5YR7/4 (pink) with 10YR8/1 (white) mottling, moderately hard, plastic, and moist | | |
| 54.6 | 55.0 | Sandy Silt, 7.5YR7/6 (reddish yellow), soft, nonplastic, and moist. Contains trace, subrounded, chert gravel without iron patina, 1.0-inch diameter | | |
| 55.0 | 57.4 | Sand, 7.5YR7/6 (reddish yellow) with frequent mottling by 7.5YR4/1 (dark gray), firm, and moist. Sand is very fine quartz grains | | |
| 57.4 | 57.9 | Gravel with Sand, 7.5YR6/4 (light brown), dense, and moist. Gravel is subangular to angular chert with iron patina, 4 mm- to 1.1-inch diameter. Sand is 80% fine quartz grains and 20% coarse, angular, chert grains | | HU4 |
| 57.9 | 58.2 | Sand as 55.0 to 57.4 ft | | |
| 58.2 | 60.0 | Sandy Gravel, 7.5YR7/4 (pink), loose, and wet. Gravel is subangular chert with iron patina, 0.4- to 0.7-inch diameter. Sand is fine quartz grains | | |

**211-A-033**

Plant North -2094.976, Plant East -5216.53 10/1/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.2 | Fill: Silt, 10YR4/1 (dark gray), soft, nonplastic, and moist. Zone of roots and humic material | | Fill |
| 0.2 | 0.6 | Fill: Silty Gravel, 10YR6/2 (light brownish gray), loose, and moist. Gravel is subangular limestone, 0.3-inch diameter | | |
| 0.6 | 3.0 | Fill: Silty Sandy Gravel, 2.5YR5/8 (red), dense, and moist. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.4-inch diameter. Sand is fine quartz grains | | |
| 3.0 | 4.2 | Silt, 10YR7/1 (light gray), soft, nonplastic, and moist | | HU1 |
| 4.2 | 15.3 | Silt, 10YR7/2 (light gray) mottled with 10YR7/4 (very pale brown), soft, nonplastic, and moist | | |
| 15.3 | 16.0 | Silty Sand, 10YR8/2 (very pale brown), dense, and dry. Sand is very fine quartz grains | | HU2 |
| 16.0 | 19.0 | Sand, 7.5YR6/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 19.0 | 19.7 | Silty Gravel, 7.5YR6/4 (light brown), dense, and moist. Gravel is subangular to angular chert with iron patina, 0.3- to 0.7-inch diameter | | |
| 19.7 | 20.0 | Clayey Silt, 10YR7/2 (light gray), moderately hard, slightly plastic, and moist | | |
| 20.0 | 20.6 | Silt with Sand. Sand is very fine quartz grains | | |
| 20.6 | 21.0 | Clayey Silt as 19.7 to 20.0 ft | | |
| 21.0 | 25.0 | Silty Gravelly Sand, 7.5YR6/4 (light brown), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.7-inch diameter | | |
| 25.0 | 26.5 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 26.5 | 27.0 | Sand with Gravel, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert with iron patina, 0.4- to 0.8-inch diameter | | |
| 27.0 | 27.4 | Sand, 7.5YR7/6 (reddish yellow), very firm, and moist. Sand is fine quartz grains | | |
| 27.4 | 28.0 | Silt with little Sand, 10YR7/3 (very pale brown), moderately soft, moderately plastic, and moist. Sand is coarse, rounded, chert grains | | |
| 28.0 | 30.1 | Sandy Gravel, 7.5YR7/4 (pink), dense, and moist. Gravel is subrounded to subangular chert with and without iron patina, 0.3- to 0.7-inch diameter | | |
| 30.1 | 30.5 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 30.5 | 30.9 | Sandy Gravel, 10YR7/4 (very pale brown), dense, and moist. Gravel is subrounded to rounded chert with and without iron patina, 0.4- to 0.8-inch diameter | | |

**211-A-033**

Plant North -2094.976, Plant East -5216.53 10/1/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 30.9 | 31.8 | Sand as 30.1 to 30.5 ft | | |
| 31.8 | 32.5 | Sandy Gravel, 10YR6/6 (brownish yellow), dense, and moist. Gravel is subrounded to subangular chert, 0.3- to 0.8-inch diameter. Sand is 90% fine quartz grains and 10% coarse, rounded, chert grains | | |
| 32.5 | 34.3 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 34.3 | 35.3 | Sandy Gravel as 31.8 to 32.5 ft | | |
| 35.3 | 35.5 | Sand as 32.5 to 34.3 ft | | |
| 35.5 | 35.8 | Sandy Gravel as 31.8 to 32.5 ft | | |
| 35.8 | 42.4 | Silt, 10YR8/2 (very pale brown) with few 10YR7/6 (yellow) laminations, soft, nonplastic to slightly plastic, and moist | | HU3 |
| 42.4 | 44.4 | Silt with Sand, 10YR8/2 (very pale brown) with few 7.5YR7/6 (reddish yellow) laminations, soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 44.4 | 48.3 | Sand, 10YR8/2 (very pale brown) with few 7.5YR7/6 (reddish yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 48.3 | 53.3 | Sand with Silt interbeds, 10YR8/3 (very pale brown) mottled with 10YR8/2 (very pale brown), soft, nonplastic to moderately plastic, and moist. Sand is very fine quartz grains | | |
| 53.3 | 54.9 | Sand, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | |
| 54.9 | 57.5 | Gravelly Sand, 10YR8/1 (white) with 2.5YR8/3 (pink) mottling, firm, and moist. Sand is fine quartz grains. Gravel is subangular to rounded chert without iron patina, 0.3- to 1.0-inch diameter | | |
| 57.5 | 57.9 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 57.9 | 61.6 | Slightly Clayey Silt, 7.5YR8/1 (white) with 7.5YR7/4 (pink) laminations, soft, moderately plastic, and moist | | |
| 61.6 | 64.1 | Sand, 10YR8/3 (very pale brown), loose, and wet. Sand is very fine quartz grains | | HU4 |
| 64.1 | 65.1 | Silt, 10YR8/1 (white), soft, plastic, and moist | | |
| 65.1 | 66.8 | Sand, 10YR8/1 (white), loose, and wet. Sand is fine quartz grains | | |
| 66.8 | 67.5 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is subangular to subrounded chert with iron patina, 0.4- to 1.0-inch diameter. Sand is fine quartz grains | | HU5 |

**211-A-035**

Plant North -2105.517, Plant East -5240.028 10/2/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.5 | Silt, 10YR5/2 (grayish brown), soft, nonplastic, and moist. Zone of roots and humic material | | Fill |
| 0.5 | 1.8 | Silty Gravel, 10YR4/1 (dark gray), loose, and moist. Gravel is subangular limestone (0.3- to 0.8-inch diameter (dense gravel aggregate/DGA) | | |
| 1.8 | 3.5 | Silt, 10YR7/2 (light gray) with some 7.5YR7/6 (reddish yellow) mottling, soft, nonplastic, and moist | | HU1 |
| 3.5 | 5.1 | Silt, 10YR8/2 (very pale brown), hard, nonplastic, and dry | | |
| 5.1 | 12.6 | Silt, 10YR7/1 (light gray) with some 7.5YR7/6 (reddish yellow) mottling, soft, nonplastic, and moist | | |
| 12.6 | 14.0 | Silt, 10YR7/4 (very pale brown), moderately hard, nonplastic, and moist | | |
| 14.0 | 15.5 | Silt with Sand, 10YR8/1 (white), moderately hard to hard, nonplastic, and dry. Sand is very fine quartz grains | | |
| 15.5 | 18.6 | Sand with some Gravel, 7.5YR6/6 (reddish yellow), lightly consolidated, and moist. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.8- to 1.0-inch diameter | | HU2 |
| 18.6 | 23.5 | Silt with Clay and some Gravel, 10YR7/1 (light gray), moderately hard, moderately plastic, and moist. Gravel is rounded chert without iron patina, 0.3- to 0.8-inch diameter | | |
| 23.5 | 24.3 | Gravelly Sand, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, rounded, chert grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.4-inch diameter | | |
| 24.3 | 26.4 | Silty Sand with some Gravel, 10YR7/3 (very pale brown), firm to dense, and moist. Sand is very fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 26.4 | 26.9 | Gravelly Sand, 7.5YR6/6 (reddish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 26.9 | 27.4 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 27.4 | 27.9 | Clayey Silt with Sand, 10YR7/3 (very pale brown) mottled with 7.5YR7/4 (pink), moderately hard, moderately to slightly plastic, and moist. Sand is fine quartz grains | | |
| 27.9 | 28.2 | Silt with Clay and some Gravel as at 18.6 to 23.5 ft | | |
| 28.2 | 28.4 | Gravelly Sand as at 26.4 to 26.9 ft | | |
| 28.4 | 28.7 | Silty Sand with some Gravel as at 24.3 to 26.4 ft | | |

**211-A-035**

Plant North -2105.517, Plant East -5240.028 10/2/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 28.7 | 29.7 | Silt with some Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 29.7 | 30.9 | Gravelly Sand, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 30.9 | 32.2 | Sand, 10YR7/4 (very pale brown) finely mottled with 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | |
| 32.2 | 34.5 | Silty Sandy Gravel, 7.5YR6/4 (light brown), dense, and moist. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.8-inch diameter. Sand is 70% fine quartz grains and 30% coarse, rounded, chert grains | | |
| 34.5 | 35.2 | Gravelly Sand, 7.5YR6/6 (reddish yellow), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subangular, chert grains. Gravel is subrounded chert without iron patina, 0.4- to 1.0-inch diameter | | |
| 35.2 | 43.2 | Silt, 7.5YR8/1 (white) mottled with 7.5YR6/6 (reddish yellow) GRADING DOWN to 10YR7/3 (very pale brown), soft, nonplastic, and moist | | HU3 |
| 43.2 | 49.4 | Sand, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) staining, firm, and moist. Sand is very fine quartz grains | | |
| 49.4 | 49.9 | Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | |
| 49.9 | 50.3 | Sand, 10YR8/3 (very pale brown) GRADING DOWN to 10YR8/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 50.3 | 51.6 | Silt with Sand, 10YR8/1 (white) GRADING DOWN to 10YR7/8 (yellow), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 51.6 | 54.7 | Clay, 7.5YR7/4 (pink) GRADING DOWN to 10YR7/3 (very pale brown), soft, plastic, and moist | | |
| 54.7 | 55.0 | Silty Sand with some Gravel, 10YR7/3 (very pale brown), firm, and moist. Sand is 90% fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 55.0 | 55.4 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 55.4 | 57.0 | Gravelly Sand, 10YR8/2 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | |

**211-A-035**

Plant North -2105.517, Plant East -5240.028 10/2/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 57.0 | 58.3 | Sand, 7.5YR8/6 (reddish yellow), loose, and wet. Sand is very fine quartz grains | | |
| 58.3 | 63.0 | Silt, 10YR8/1 (white) with 10YR7/6 (yellow) laminations GRADING DOWN to massive 10YR8/1 (white), soft, plastic, and moist | | |
| 63.0 | 65.3 | Sand, 10YR8/3 (very pale brown), lightly consolidated, and very moist. Sand is very fine quartz grains | | HU4 |
| 65.3 | 66.3 | Silt, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) laminations, soft, plastic, and moist | | |
| 66.3 | 66.5 | Sand, 7.5YR7/8 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | |

**211-A-036**

Plant North -2051.946, Plant East -5261.363 10/3/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 0.6 | Silt, 10YR3/1 (very dark gray), soft, nonplastic, and moist. Zone of roots and humic material | | HU1 |
| 0.6 | 1.8 | Silt, 10YR6/3 (pale brown), moderately hard, slightly plastic, and moist | | |
| 1.8 | 4.6 | Silt, 10YR8/2 (very pale brown) with little mottling by 10YR7/6 (yellow), hard, nonplastic, and dry | | |
| 4.6 | 14.5 | Silt, 10YR7/2 (light gray) with little 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | |
| 14.5 | 14.8 | Sand, 10YR7/8 (yellow), firm to dense, and moist. Sand is very fine quartz grains | | |
| 14.8 | 16.5 | Silt as 4.6 to 14.5 ft | | |
| 16.5 | 18.1 | Silt with thin Sand interbeds, 10YR8/2 (very pale brown) GRADING DOWN to 7.5YR6/6 (reddish yellow). Silt is moderately soft, slightly plastic, and moist. Sand is fine quartz grains, firm, and moist | | |
| 18.1 | 20.1 | Silt, 7.5YR7/4 (pink), soft, slightly plastic, and moist | | |
| 20.1 | 20.3 | Silt with some Sand, 10YR7/3 (very pale brown), hard, nonplastic, and dry. Sand is very fine quartz grains | | |
| 20.3 | 25.5 | Sand with Gravel and some Silt, 7.5YR7/3 (pink) with some 7.5YR3/1 (very dark gray) staining (manganese?), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.4-inch diameter | | HU2 |
| 25.5 | 25.8 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 25.8 | 26.1 | Sand with Gravel and some Silt as 20.3 to 25.5 ft | | |
| 26.1 | 26.7 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 26.7 | 27.1 | Silty Sand with some Gravel, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 4 mm- to 0.4-inch diameter | | |
| 27.1 | 30.0 | Silt, 10YR7/3 (very pale brown), mottled with 10YR8/1 (white), soft, plastic, and moist | | |
| 30.0 | 32.5 | Disturbed soil (Sandy Silt with some Gravel) | | |
| 32.5 | 35.5 | Gravelly Sand, 10YR5/6 (yellowish brown), firm, and moist. Sand is 80% fine quartz grains and 20% coarse, subangular to subrounded, chert grains. Gravel is subrounded chert with iron patina(?), 0.3- to 1.0-inch diameter | | |
| 35.5 | 42.9 | Silt, 7.5YR8/1 (white) mottled with 7.5YR6/6 (reddish yellow) and 7.5YR8/6 (reddish yellow), soft, moderately plastic, and moist | | |
| 42.9 | 43.7 | Sandy Silt, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft, nonplastic, and moist. Sand is very fine quartz grains | | |

**211-A-036**

Plant North -2051.946, Plant East -5261.363 10/3/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 43.7 | 47.4 | Clayey Silt, 10YR8/2 (very pale brown) with 7.5YR7/4 (pink) laminations, moderately hard, plastic, and moist | | HU3 |
| 47.4 | 49.9 | Silt, 10YR8/2 (very pale brown) mottled with 7.5YR6/4 (light brown) and with slight 2.5YR7/6 (light red) staining, soft, plastic, and moist | | |
| 49.9 | 52.1 | Sand, 10YR8/1 (very pale brown) with 10YR7/6 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 52.1 | 53.2 | Silt, 10YR7/3 (very pale brown), soft to moderately soft, plastic, and moist | | |
| 53.2 | 55.0 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 55.0 | 56.0 | Sand with Gravel, 10YR7/8 (yellow), firm, and moist. Sand is 80% fine quartz grains and 20% coarse-to-very-coarse, subrounded, chert grains. Gravel is subrounded chert without iron patina, 4 mm- to 0.4-inch diameter | | |
| 56.0 | 60.9 | Interbedded Silt, 10YR8/1 (white), soft, moderately plastic, and moist AND very fine quartz Sand, 10YR8/1 (white) with few 10YR7/6 (yellow) laminations, lightly consolidated, and moist-to-wet | | |
| 60.9 | 62.3 | Sand, 10YR8/1 (white), tinged with 10YR7/6 (yellow) at base, firm, and moist. Sand is very fine quartz grains | | HU4 |
| 62.3 | 62.5 | Sand with Gravel, 10YR7/6 (yellow), loose, and wet. Sand is fine to medium, rounded, quartz grains. Gravel is subrounded chert with iron patina, 0.4- to 0.8-inch diameter | | |

**211-B-001**

Plant North -2607.698, Plant East -5240.899 10/9/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 4.0 | Gravelly Sand, 2.5YR6/6 (light red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.7-inch diameter | | FILL |
| 4.0 | 5.0 | Silt, 10YR7/2 (light gray), soft, nonplastic, and moist | | HU1 |
| 5.0 | 8.0 | Permeameter sample - no description | | NO DESCRIPTION |
| 8.0 | 10.3 | Silt as 4.0 to 5.0 ft | | HU1 |
| 10.3 | 13.7 | Silt with Sand, hard, nonplastic, and moist. Sand is very fine quartz grains | | |
| 13.7 | 15.0 | Silt with little Clay and Gravel, 10YR7/2 (light gray) stained with 5YR5/4 (reddish brown), moderately hard, slightly plastic, and moist | | |
| 15.0 | 18.0 | Permeameter sample - no description | | NO DESCRIPTION |
| 18.0 | 19.0 | Gravelly Sand, 10YR7/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 0.3- to 0.7-inch diameter | | HU2 |
| 19.0 | 20.0 | Gravelly Sand with Silt, 10YR7/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 0.3- to 0.7-inch diameter | | |
| 20.0 | 23.1 | Silt with some Sand and Gravel, 10YR6/4 (light yellowish brown), moderately hard, nonplastic, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 1.0-inch diameter | | |
| 23.1 | 25.1 | Gravelly Sand, 10YR6/4 (light yellowish brown), dense and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert | | |
| 25.1 | 28.4 | Silt, 10YR8/3 (very pale brown) mottled with 10YR8/1 (white), soft, nonplastic to slightly plastic, and moist | | |
| 28.4 | 33.0 | Gravelly Sand, 10YR7/3 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with and without iron patina, 0.3- to 0.9-inch diameter | | |
| 33.0 | 33.4 | Sand with little Gravel, firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without(?) iron patina, 0.3- to 0.5-inch diameter | | |
| 33.4 | 35.0 | Gravelly Sand, 10YR7/6 (yellow), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with and without iron patina, 0.3- to 0.9-inch diameter | | |
| 35.0 | 38.0 | Permeameter sample - no description | | NO DESCRIPTION |
| 38.0 | 39.0 | Silt, 10YR7/1 (light gray), soft, nonplastic, and moist | | |

**211-B-001**

Plant North -2607.698, Plant East -5240.899 10/9/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 39.0 | 40.0 | Silt with Sand, 10YR7/4 (very pale brown), moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | HU3 |
| 40.0 | 47.0 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 10YR7/4 (very pale brown), moderately soft, moderately plastic, and moist | | |
| 47.0 | 52.4 | Silt with little Sand, soft, nonplastic to slightly plastic, and moist. Sand is very fine quartz grains | | |
| 52.4 | 56.5 | Silt with little Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white), moderately hard, slightly plastic, and moist | | |
| 56.5 | 59.4 | Silt with Sand, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 59.4 | 61.6 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | HU4 |
| 61.6 | 62.3 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 62.3 | 62.5 | Sand, 7.5YR6/8 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |

**211-B-002**

Plant North -2608.457, Plant East -5201.467 10/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.5 | Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is 85% fine quartz grains and 15% coarse, subrounded to subangular, chert grains. Gravel is subrounded to subangular chert with iron patina, 4-mm to 0.6-inch diameter | | FILL |
| 3.5 | 13.4 | Silt, 10YR7/1 (light gray) with 10YR7/4 (very pale brown) mottling, soft, nonplastic, and moist | | HU1 |
| 13.4 | 14.1 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 14.1 | 15.9 | Silt with little Clay, 10YR7/3 (very pale brown) with little 10YR7/6 (yellow) mottling, moderately hard, slightly plastic, and moist | | |
| 15.9 | 17.0 | Silt with little Clay and Gravel, 10YR7/3 (very pale brown) GRADING DOWN to 7.5YR6/6 (reddish yellow), moderately hard, slightly plastic, and moist. Gravel is rounded to subrounded chert without iron patina, 0.4- to 0.6-inch diameter | | |
| 17.0 | 17.5 | Silt with some Clay, 10YR7/2 (light gray), soft, moderately plastic, and moist | | |
| 17.5 | 19.1 | Gravelly Sand, 7.5YR7/4 (pink), dense, and moist. Sand is 70% fine quartz grains and 30% coarse to very coarse, subrounded, chert grains. Gravel is subangular to subrounded chert with iron patina, 4-mm to 0.5-inch diameter | | HU2 |
| 19.1 | 19.5 | Sand, 10YR7/6 (yellow), dense, and moist. Sand is fine quartz grains | | |
| 19.5 | 20.3 | Gravelly Sand as 17.5 to 19.1 ft | | |
| 20.3 | 21.2 | Silt with little Clay and Gravel as 15.9 to 17.0 ft | | |
| 21.2 | 23.0 | Sand with some Gravel, 7.5YR6/4 (light brown), dense, and moist. Sand is 70% fine quartz grains and 30% coarse to very coarse, subrounded, chert grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 23.0 | 27.3 | Silt with some Clay, 10YR7/1 (light gray) mottled with 10YR7/8 (yellow), soft, plastic, and moist | | |
| 27.3 | 28.4 | Sand, 10YR7/8 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 28.4 | 31.3 | Silty Sand with Gravel, 7.5YR7/3 (pink), dense, and moist. Sand is fine to medium quartz grains. Gravel is subangular to subrounded chert with and without iron patina, 0.4- to 1.0-inch diameter | | |
| 31.3 | 33.3 | Sand with some Gravel, 10YR7/4 (very pale brown) GRADING DOWN to 10YR8/1 (white), firm, and moist. Sand is fine to medium quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.6-inch diameter | | |
| 33.3 | 38.5 | Silt with Sand, 10YR8/3 (very pale brown), very soft, nonplastic, and moist. Sand is very fine quartz grains | | |

**211-B-002**

Plant North -2608.457, Plant East -5201.467 10/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 38.5 | 40.0 | Silt with Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is fine quartz grains | | HU3 |
| 40.0 | 42.4 | Silt with little Clay, 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, moderately plastic, and moist | | |
| 42.4 | 44.8 | Silt, 10YR8/1 (white) mottled with 10YR7/8 (yellow), soft, nonplastic, and moist | | |
| 44.8 | 47.4 | Silt with little Clay, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, moderately hard, moderately plastic, and moist | | |
| 47.4 | 50.4 | Silt with Clay, 10YR7/4 (very pale brown) mottled with 10YR8/2 (very pale brown), moderately hard, moderately plastic, and moist | | |
| 50.4 | 51.0 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 51.0 | 52.5 | Silt, 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, moderately plastic, and moist | | |
| 52.5 | 56.0 | Silt with little Clay, 7.5YR7/4 (pink) with little 7.5YR8/1 (white) mottling, moderately hard, slightly plastic, and moist | | |
| 56.0 | 59.0 | Silt with some Clay, 7.5YR8/1 (white) mottled with 7.5YR7/3 (pink), soft, moderately plastic, and moist | | |
| 59.0 | 60.5 | Sand, 10YR8/2 (very pale brown) with 10YR7/8 (yellow) laminations, lightly consolidated, and moist. Sand is very fine quartz grains | | HU4 |
| 60.5 | 63.0 | Sand, 10YR8/2 (very pale brown) with some 2.5YR7/4 (light reddish brown) and 7.5YR7/8 (reddish yellow) laminations, firm, and moist. Sand is fine quartz grains | | |
| 63.0 | 64.5 | Sand with little Gravel, 10YR8/2 (very pale brown), loose, and wet. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 64.5 | 65.0 | Sand, 10YR8/1 (white) with 7.5YR7/8 (reddish yellow) staining, loose, and wet. Sand is fine quartz grains | | |

**211-B-003**

Plant North -2607.365, Plant East -5181.15 10/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.0 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.8-inch diameter | | Fill |
| 3.0 | 13.6 | Silt, 10YR7/1 (light gray) with 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | HU1 |
| 13.6 | 15.9 | Silt with little Clay and little Gravel, 10YR7/2 (light gray), moderately hard, slightly plastic, and moist. Gravel is subrounded chert without iron patina, 0.4- to 0.5-inch diameter | | |
| 15.9 | 16.9 | Sandy Gravel with little Silt, 7.5YR7/2 (pinkish gray), dense, and moist. Gravel is subangular to rounded chert with and without iron patina, 4 mm- to 0.7-inch diameter. Sand is fine quartz grains | | HU2 |
| 16.9 | 17.8 | Sand with little Gravel, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 0.4- to 0.6-inch diameter | | |
| 17.8 | 20.1 | Sandy Silt with little Gravel and little Clay, 10YR7/2 (light gray), moderately hard, nonplastic, and moist. Sand is fine quartz grains. Gravel is subangular to angular chert without iron patina, 0.4- to 0.8-inch diameter | | |
| 20.1 | 22.3 | Gravelly Sand with little Silt, 7.5YR6/4 (light brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert without(?) iron patina, 0.3- to 0.6-inch diameter | | |
| 22.3 | 22.9 | Sand, 10YR7/8 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 22.9 | 27.0 | Silt with Sand, 10YR8/4 (very pale brown) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 27.0 | 27.4 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 27.4 | 28.9 | Sand with little Gravel, 10YR7/4 (very pale brown) GRADING DOWN to 10YR8/1 (white), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with and without iron patina, 0.3- to 0.8-inch diameter | | |
| 28.9 | 30.4 | Sand with Gravel, 10YR7/3 (very pale brown), dense, and moist. Sand is 75% fine quartz grains and 25% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert without(?) iron patina, 0.3- to 0.4-inch diameter | | |
| 30.4 | 31.4 | Sand, 10YR7/6 (yellow), firm to dense, and moist. Sand is fine quartz grains | | |

**211-B-003**

Plant North -2607.365, Plant East -5181.15 10/10/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 31.4 | 33.0 | Sand with Gravel, 7.5YR6/4 (light brown), dense, and moist. Sand is fine to medium quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.4-inch diameter | | |
| 33.0 | 35.9 | Silt, 7.5YR7/3 (pink) GRADING DOWN to 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist | | HU3 |
| 35.9 | 36.7 | Silt with Sand, 7.5YR7/4 (pink), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 36.7 | 38.8 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 38.8 | 40.1 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 40.1 | 42.5 | Silt with little Clay, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, moderately soft, moderately plastic, and moist | | |
| 42.5 | 47.0 | Silt with some Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR7/4 (pink), moderately hard, slightly plastic, and moist | | |
| 47.0 | 51.0 | Silt with Sand, 10YR7/4 (very pale brown) with some 7.5YR8/1 (white) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 51.0 | 54.0 | Silt with little Clay, 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft to moderately soft, moderately plastic, and moist | | |
| 54.0 | 56.3 | Silt, 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately hard, nonplastic, and moist | | |
| 56.3 | 58.5 | Silt with Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 58.5 | 60.0 | Sand, 10YR8/2 (very pale brown) GRADING DOWN to 7.5YR8/4 (pink), firm, and moist. Sand is very fine quartz grains | | HU4 |

**211-B-004**

Plant North -2607.187, Plant East -5143.33 10/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.6 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | Fill |
| 3.6 | 7.5 | Silt, 10YR7/1 (light gray) with some 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | HU1 |
| 7.5 | 10.0 | Permeameter Sample - No Description | | |
| 10.0 | 12.5 | Silt as 3.6 to 7.5 ft | | |
| 12.5 | 13.3 | Sand, 10YR8/4 (very pale brown), dense, and moist. Sand is very fine quartz grains | | |
| 13.3 | 14.7 | Silt, 10YR7/4 (very pale brown), soft, slightly plastic, and moist | | |
| 14.7 | 15.0 | Silt with little Gravel and little Clay, 10YR7/2 (light gray) mottled with 7.5YR6/6 (reddish yellow), moderately hard, slightly to moderately plastic, and moist. Gravel is subangular chert without iron patina, 0.3-inch diameter | | |
| 15.0 | 15.5 | Slough: Silt, 10YR7/2 (light gay), very soft, nonplastic, and moist | | |
| 15.5 | 17.2 | Silt with little Clay and little Gravel, 7.5YR7/2 (pinkish gray) with 7.5YR7/6 (reddish yellow) staining, moderately hard, moderately plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 1.0-inch diameter | | |
| 17.2 | 17.5 | Sand with Gravel, 7.5YR7/4 (pink), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with(?) iron patina, 0.4- to 0.6-inch diameter | | HU2 |
| 17.5 | 20.0 | Permeameter Sample - No Description - Appeared similar to Sand with Gravel of 17.2 to 17.5 ft | | |
| 20.0 | 21.1 | Silt with little Clay and little Gravel as 15.5 to 17.2 ft | | |
| 21.1 | 23.8 | Sand with Gravel, 7.5YR7/4 (pink), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 0.3- to 0.5-inch diameter | | |
| 23.8 | 24.2 | Sand, 7.5YR7/4 (pink), firm, and moist. Sand is fine to medium quartz grains | | |
| 24.2 | 24.6 | Silt with some Gravel, 10YR7/1 (light gray) with 7.5YR7/6 (reddish yellow) staining, soft, plastic, and moist. Gravel is subrounded chert without(?) iron patina, 1.0-inch diameter | | |
| 24.6 | 26.0 | Sand, 10YR8/2 (very pale brown) GRADING DOWN to 10YR8/4 (very pale brown), dense, and moist. Sand is fine quartz grains | | |
| 26.0 | 26.5 | Gravelly Sand with Silt, 10YR7/6 (yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.6-inch diameter | | |

**211-B-004**

Plant North -2607.187, Plant East -5143.33 10/11/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 26.5 | 28.5 | Silt with Sand, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 28.5 | 30.0 | Sand with Gravel, 10YR8/3 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 4 mm- to 0.6-inch diameter | | |
| 30.0 | 31.9 | Sand with Gravel and some Silt, 7.5YR6/6 (reddish yellow). Sand is 80% fine to medium quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert without(?) iron patina, 4 mm- to 0.5-inch diameter | | |
| 31.9 | 32.7 | Silt with Clay, 7.5YR6/6 (reddish yellow), moderately soft, plastic, and moist | | HU3 |
| 32.7 | 42.4 | Silt, 7.5YR6/6 (reddish yellow) GRADING DOWN to 10YR7/6 (yellow) and then to 10YR8/3 (very pale brown), soft, slightly plastic, and moist | | |
| 42.4 | 50.0 | Silt with little Clay, 7.5YR8/4 (pink) with some 7.5YR7/6 (reddish yellow) mottling, moderately soft, plastic, and moist | | |
| 50.0 | 52.1 | Silt with Sand, 10YR8/1 (white) with 10YR8/6 (yellow) laminations, soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 52.1 | 54.6 | Silt with Sand, 5YR8/2 (pinkish white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 54.6 | 55.4 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is very fine to fine quartz grains | | |
| 55.4 | 56.8 | Silt with Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 56.8 | 57.5 | Silt with some Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white), moderately hard, slightly plastic, and moist | | |
| 57.5 | 61.0 | Silt with Sand, 7.5YR8/1 (white) mottled with 5YR6/6 (reddish yellow), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 61.0 | 64.6 | Sand, 10YR8/3 (very pale brown), loose, and wet. Sand is fine quartz grains | | HU4 |
| 64.6 | 65.0 | Sand with Gravel, 10YR8/2 (very pale brown), firm and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 1.0-inch diameter | | HU5 |

**211-B-005**

Plant North -2606.307, Plant East -5129.596 10/15/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.2 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.4- to 0.7-inch diameter | | Fill |
| 1.2 | 2.5 | Silt with Gravel, 5YR7/3 (pink), soft, plastic, and moist. Gravel is rounded to subrounded chert with iron patina, 0.3- to 0.8-inch diameter | | |
| 2.5 | 13.1 | Silt, 10YR7/1 (light gray) GRADING DOWN to 10YR7/4 (very pale brown) mottled with 10YR7/1 (light gray), soft, nonplastic, and moist | | HU1 |
| 13.1 | 13.7 | Sand, 10YR8/2 (very pale brown), dense, and moist. Sand is very fine quartz grains | | HU2 |
| 13.7 | 14.4 | Silt with little Clay, 10YR6/4 (light yellowish brown), GRADING DOWN to 10YR7/1 (light gray), moderately hard, moderately plastic, and moist | | |
| 14.4 | 17.3 | Sand with Gravel and little Silt, 10YR8/1 (white) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 1.0-inch diameter | | |
| 17.3 | 18.2 | Sand with Gravel, 10YR7/4 (very pale brown), dense, and moist. Sand is 70% fine quartz grains and 30% coarse to very coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.4-inch diameter | | |
| 18.2 | 19.7 | Silt, 10YR7/6 (yellow) mottled with 10YR8/1 (white), moderately soft, slightly plastic, and moist | | |
| 19.7 | 23.3 | Sand with Gravel, 10YR6/6 (brownish yellow), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.8-inch diameter | | |
| 23.3 | 24.1 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 24.1 | 26.7 | Silt, 10YR8/4 (very pale brown) GRADING DOWN to 10YR8/4 (very pale brown) mottled with 10YR8/1 (white), soft, plastic, and moist | | |
| 26.7 | 29.2 | Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 29.2 | 30.6 | Sand with some Gravel, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 0.3- to 0.5-inch diameter | | |

**211-B-005**

Plant North -2606.307, Plant East -5129.596 10/15/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 30.6 | 31.7 | Gravelly Sand with little Silt, 10YR7/4 (very pale brown), dense, and moist. Sand is 60% fine to medium quartz grains and 40% coarse to very coarse, subrounded, chert grains. Gravel is subrounded chert with(?) iron patina, 0.3- to 0.5-inch diameter | | |
| 31.7 | 35.5 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist | | HU3 |
| 35.5 | 39.2 | Silt with Sand, 10YR8/6 (yellow) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 39.2 | 43.1 | Silt with little Clay, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |
| 43.1 | 46.6 | Silt with little Clay as above but moderately hard and slightly plastic | | |
| 46.6 | 48.6 | Sand, 10YR8/1 (white) with some 10YR7/4 (very pale brown) mottling, firm, and moist. Sand is fine quartz grains | | |
| 48.6 | 49.6 | Silt with Sand, 10YR8/2 (very pale brown) GRADING DOWN to 10YR7/6 (yellow), soft to moderately soft, moderately plastic, and moist. Sand is very fine quartz grains | | |
| 49.6 | 52.3 | Sand with little Silt, 10YR6/6 (brownish yellow), firm, and moist. Sand is very fine to fine sand | | |
| 52.3 | 53.1 | Silt, 10YR8/3 (very pale brown), soft, nonplastic, and moist | | |
| 53.1 | 54.5 | Sand, 10YR8/2 (very pale brown) with 10YR6/6 (brownish yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 54.5 | 57.5 | Silt with little Clay, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), moderately hard, slightly plastic, and moist | | |
| 57.5 | 59.4 | Interbedded Sand and Silt, 7.5YR7/3 (pink). Sand is fine quartz grains, firm and moist. Silt is soft, plastic, and moist | | HU4 |
| 59.4 | 62.3 | Sand, 7.5YR7/4 (pink), firm to loose, and very moist to wet. Sand is fine quartz grains | | |
| 62.3 | 62.5 | Silt, 10YR8/3 (pink), soft, moderately plastic, and moist | | |
| 62.5 | 64.6 | Sand with little Gravel, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 0.7- to 1.0-inch diameter | | |
| 64.6 | 65.0 | Sand, 10YR8/1 (white), firm, and very moist. Sand is very fine quartz grains | | |

**211-B-006**

Plant North -2611.28, Plant East -5085.431 10/15/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.2 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.4- to 0.6-inch diameter | | Fill |
| 3.2 | 12.4 | Silt, 10YR7/1 (light gray) with some 10YR7/4 (very pale brown) mottling GRADING DOWN to 10YR7/4 (very pale brown) with 10YR7/1 (light gray) mottling, soft, nonplastic, and moist | | HU1 |
| 12.4 | 16.4 | Sand with little Gravel, 10YR8/2 (very pale brown) mottled with 10YR6/4 (light yellowing brown), firm to dense, and moist. Sand is very fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.4-inch diameter | | HU2 |
| 16.4 | 18.8 | Silt with little Clay and little Gravel, 10YR7/1 (light gray) with 10YR7/4 (very pale brown) mottling, moderately hard, slightly to moderately plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.7-inch diameter | | |
| 18.8 | 20.3 | Sand with Gravel, 10YR7/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert (and trace of feldspar)without iron patina , 0.3- to 0.4-inch diameter. | | |
| 20.3 | 20.9 | Silt with Sand and little Gravel, 10YR7/2 (light gray), moderately hard, nonplastic, and moist. Sand is fine quartz grains | | |
| 20.9 | 21.7 | Sand with Gravel as 18.8 to 20.3 ft | | |
| 21.7 | 24.5 | Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately soft, moderately plastic, and moist | | |
| 24.5 | 27.2 | Silt with Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 27.2 | 34.0 | Gravelly Sand (85% fine quartz grains and 15% coarse, subrounded, chert grains) with 0.3- to 0.4-ft interbeds of fine Sand, 10YR7/4 (very pale brown); dense, and moist. Gravel is subrounded to rounded chert with and without iron patina, 0.3- to 0.7-inch diameter | | |
| 34.0 | 35.2 | Silt with Clay, 7.5YR7/4 (pink), moderately hard, slightly plastic, and moist | | |
| 35.2 | 36.2 | Silt, 10YR8/2 (very pale brown), soft, nonplastic, and moist | | |
| 36.2 | 37.7 | Silty Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 37.7 | 38.2 | Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |

**211-B-006**

Plant North -2611.28, Plant East -5085.431 10/15/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 38.2 | 40.0 | Silt, 10YR8/3 (very pale brown) with 5YR7/8 (light red) laminations, soft to moderately soft, nonplastic, and moist | | HU3 |
| 40.0 | 44.9 | Silt, 7.5YR6/2 (pinkish gray) mottled with 7.5YR7/6 (reddish yellow) GRADING DOWN to 7.5YR7/2 (pinkish gray) with 7.5YR7/4 (pink) mottling, moderately hard, moderately plastic, and moist | | |
| 44.9 | 48.0 | Silty Sand GRADING DOWN to Sand, 10YR7/3 (very pale brown) with 10YR7/4 (very pale brown) laminations/mottling, firm, and moist. Sand is very fine quartz grains | | |
| 48.0 | 49.4 | Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 49.4 | 55.5 | Silt with little Clay, 7.5YR8/2 (pinkish white) mottled with 7.5YR7/6 (reddish yellow), moderately soft, plastic to moderately plastic, and moist | | |
| 55.5 | 58.0 | Silt with little Clay, 7.5YR7/4 (pink) with little 7.5YR8/1 (white) mottling, moderately hard, slightly plastic, and moist | | |
| 58.0 | 58.5 | Silt with little Clay as 55.5 to 58.0 ft but colored 7.5YR8/2 (pinkish white) | | |
| 58.5 | 61.7 | Sand with some Silt blebs, 10YR7/6 (yellow) and dense, GRADING DOWN to 10YR8/2 (very pale brown) and lightly consolidated; and moist. Sand is very fine quartz grains | | HU4 |
| 61.7 | 62.3 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 62.3 | 62.5 | Sand with Gravel, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |

**211-B-007**

Plant North -2611.717, Plant East -5056.859 10/16/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.6 | Gravelly Sand, 2.5YR6/6 (red), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | Fill |
| 2.6 | 3.2 | Silty Sand with Gravel, 5YR7/4 (pink), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 1.0-inch diameter | | |
| 3.2 | 14.4 | Silt, 10YR8/2 (very pale brown) with little 10YR7/6 (yellow) mottling GRADING DOWN to 10YR7/4 (very pale brown), soft, nonplastic, and moist | | HU1 |
| 14.4 | 15.0 | Silt GRADING DOWN to Sand, 10YR8/1 (white) GRADING DOWN to 10YR8/4 (very pale brown), moderately soft/firm, nonplastic, and moist. Sand is very fine quartz grains | | |
| 15.0 | 19.6 | Silt with Clay and some Gravel, 10YR7/1 (light gray) with little 10YR7/4 (very pale brown) mottling, moderately soft/stiff, slightly to moderately plastic, and moist. Gravel is rounded to subrounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 19.6 | 20.0 | Silt with Sand, 10YR7/6 (yellow), moderately soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 20.0 | 20.3 | Silt with Clay and some Gravel as 15.0 to 19.6 ft | | |
| 20.3 | 23.0 | Sand with Gravel, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.5-inch diameter | | HU2 |
| 23.0 | 24.9 | Silty Sand, 10YR8/6 (yellow) mottled with 10YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 24.9 | 25.1 | Sand, 7.5YR7/8 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 25.1 | 26.4 | Silty Sand as 23.0 to 24.9 ft | | |
| 26.4 | 32.0 | Gravelly Sand, 7.5YR7/4 (pink), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 32.0 | 34.6 | Gravelly Sand with little Silt, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 34.6 | 35.5 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is very fine to fine quartz grains | | |
| 35.5 | 45.0 | Silt, 7.5YR8/4 (pink) with 7.5YR7/6 (reddish yellow) laminations GRADING DOWN to 7.5YR8/2 (pinkish white) with 7.5YR7/6 (reddish yellow) laminations, very soft, nonplastic, and moist | | |

**211-B-007**

Plant North -2611.717, Plant East -5056.859 10/16/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 45.0 | 46.4 | Silty Sand, GRADING DOWN to Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations/mottling, firm, and moist. Sand is very fine quartz grains | | |
| 46.4 | 48.2 | Sand, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) mottling and staining, firm, and moist. Sand is fine quartz grains | | |
| 48.2 | 49.6 | Gravelly Sand, 10YR7/3 (very pale brown), dense, and moist. Sand is 85% fine quartz grains and 15% coarse, subrounded, chert grains. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 49.6 | 50.0 | Silt with little Clay, 7.5YR7/6 (reddish yellow), moderately hard, slightly plastic, and moist | | HU3 |
| 50.0 | 51.4 | Silt, 7.5YR8/4 (pink) with 7.5YR8/1 (white) mottling, soft, plastic, and moist | | |
| 51.4 | 54.5 | Silt with Sand, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 54.5 | 58.6 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic to plastic, and moist | | |
| 58.6 | 61.0 | Silty Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) and 5YR7/6 (reddish yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 61.0 | 64.7 | Sand with few Silt blebs, 10YR8/1 (white) GRADING DOWN to 10YR8/4 (very pale brown), firm to loose, and moist to wet. Sand is fine quartz grains | | HU4 |
| 64.7 | 65.0 | Sand, 7.5YR7/6 (reddish yellow), lightly consolidated, and wet. Sand is fine quartz grains | | |

**211-B-008**

Plant North -2642.029, Plant East -5211.033 — 10/9/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.7 | Sand with Gravel/Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | Fill |
| 2.7 | 13.1 | Silt, 10YR7/1 (light gray) with some 10YR7/6 (yellow) mottling, soft, nonplastic, and moist | | HU1 |
| 13.1 | 14.8 | Interbedded fine Sand, 7.5YR6/6 (reddish yellow) and very fine Sand (7.5YR8/1 (white), firm, and moist. Sand is quartz grains | | |
| 14.8 | 17.0 | Gravelly Sand, 7.5YR5/6 (strong brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.6-inch diameter | | |
| 17.0 | 17.7 | Sand, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains | | |
| 17.7 | 21.3 | Gravelly Sand as 14.8 to 17.0 ft | | |
| 21.3 | 21.7 | Sand with Gravel, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 21.7 | 22.3 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 22.3 | 26.0 | Silt, 10YR8/4 (Very pale brown) mottled with 10YR8/1 (white), soft, plastic to moderately plastic, and moist | | |
| 26.0 | 27.1 | Sand with little Gravel, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | HU2 |
| 27.1 | 28.0 | Gravelly Sand, 10YR8/1 (white) mottled with 10YR8/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.4-inch diameter | | |
| 28.0 | 28.8 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 28.8 | 30.0 | Sandy Gravel, 10YR8/2 (very pale brown), dense, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 30.0 | 30.8 | Sandy Gravel as 28.8 to 30.0 ft but with Silt | | |
| 30.8 | 32.4 | Sandy Gravel as 28.8 to 30.0 ft | | |
| 32.4 | 37.0 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 7.5YR8/2 (pinkish white), soft, plastic to moderately plastic, and moist | | |
| 37.0 | 40.8 | Silt with Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white), soft, plastic, and moist | | |

**211-B-008**

Plant North -2642.029, Plant East -5211.033 10/9/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 40.8 | 41.7 | Silt with Clay as 37.0 to 40.8 ft but very soft | | HU3 |
| 41.7 | 43.0 | Silt with Clay, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 10YR8/2 (very pale brown), moderately hard, moderately plastic, and moist | | |
| 43.0 | 47.4 | Silt with Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately soft with blebs of both moderately hard and soft, slightly to moderately plastic, and moist | | |
| 47.4 | 49.5 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains. Note: 49.2 to 49.5 ft contains some chert gravel with iron patina, subrounded, 0.3-inch diameter | | |
| 49.5 | 55.1 | Silt with Clay, 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately hard, slightly plastic, and moist | | |
| 55.1 | 58.0 | Silt with Sand, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) GRADING DOWN to 10YR8/3 (very pale brown), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 58.0 | 58.5 | Sand, 10YR8/6 (yellow), firm, and moist. Sand is very fine quartz grains | | HU4 |
| 58.5 | 60.2 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 60.2 | 60.5 | Sand with Silt and Gravel, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is rounded chert without iron patina, 0.3-inch diameter | | |
| 60.5 | 62.0 | Sand with a few Silt interbeds, 10YR8/2 (very pale brown), lightly consolidated to firm, and moist. Sand is fine quartz grains | | |
| 62.0 | 62.1 | Sandy Gravel, 10YR7/4 (very pale brown), loose, and moist. Gravel is subrounded chert with iron patina, 0.3-inch diameter. Sand is fine quartz grains | | |
| 62.1 | 62.5 | Sand with a few Silt interbeds as 60.5 to 62.0 ft | | |

**211-B-009**

Plant North -2642.058, Plant East -5180.914 10/8/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.4 | Gravelly Sand with little Silt, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.8-inch diameter | | FILL |
| 2.4 | 14.2 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist | | HU2 |
| 14.2 | 15.2 | Clayey Silt, 10YR7/2 (light gray), moderately hard, moderately plastic, and moist | | |
| 15.2 | 16.7 | Silty Sand, 10YR7/1 (light gray), firm, and moist. Sand is very fine quartz grains | | HU2 |
| 16.7 | 20.1 | Gravelly Sand with little Silt, 10YR6/4 (light yellowish brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with and without iron patina, 0.3 - to 0.6-inch diameter | | |
| 20.1 | 21.2 | Silty Sand with Gravel, 10YR7/1 (light gray), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert without iron patina, 0.5- to 0.8-inch diameter | | |
| 21.2 | 23.5 | Gravelly Sand with little Silt, 10YR6/6 (brownish yellow), dense, and moist. Sand is 90% fine quartz grains and 10% subrounded, coarse, chert grains. Gravel is subrounded chert with and without iron patina, 0.3- to 0.5-inch diameter | | |
| 23.5 | 26.7 | Sand, 10YR8/1 (white) with 10YR7/6 (yellow) mottling, firm, and moist. Sand is very fine quartz grains | | |
| 26.7 | 29.5 | Gravelly Sand, 10YR8/2 (very pale brown) GRADING DOWN to 10YR7/6 (yellow), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subrounded chert with and without iron patina, 4-mm to 0.6-inch diameter | | |
| 29.5 | 30.2 | Gravelly Sand with Silt, 7.5YR7/1 (light gray), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subrounded chert with and without iron patina, 4-mm to 0.6-inch diameter | | |
| 30.2 | 31.0 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 31.0 | 34.0 | Gravelly Sand as 26.7 to 29.5 ft | | |
| 34.0 | 35.0 | Silty Clay, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, soft, plastic, and moist | | |
| 35.0 | 37.6 | Silt with Sand, 10YR7/2 (light gray) with little 10YR7/6 (yellow) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 37.6 | 39.1 | Silt with little Clay, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), soft, plastic, and moist | | |

**211-B-009**

Plant North -2642.058, Plant East -5180.914 10/8/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 39.1 | 42.7 | Silt with little Clay as 37.6 to 39.1 ft interbedded with Clay with Silt, 10YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white) and 7.5YR7/4 (pink), soft, plastic, and moist | | HU3 |
| 42.7 | 45.5 | Silt, 7.5YR7/6 (reddish yellow), moderately soft, nonplastic, and moist | | |
| 45.5 | 46.7 | Silt with some Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) and 7.5YR6/1 (gray), soft to moderately soft, plastic, and moist | | |
| 46.7 | 52.3 | Silt with Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 52.3 | 54.5 | Silt with little Clay, 7.5YR6/6 (reddish yellow) with some 7.5YR8/1 (white) mottling, moderately soft, slightly plastic, and moist | | |
| 54.5 | 55.0 | Silt with little Clay, 7.5YR6/6 (reddish yellow) with some 7.5YR8/1 (white) mottling, soft, plastic, and moist | | |
| 55.0 | 59.1 | Silt with Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow)-GRADING-DOWN-to-7.5YR7/4 (pink) laminations, soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 59.1 | 60.3 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | HU4 |
| 60.3 | 62.5 | Sand, 10YR8/2 (very pale brown), lightly consolidated, and moist. Sand is very fine quartz grains | | |
| 62.5 | 63.1 | Sand with some Gravel, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 63.1 | 64.0 | Sand, 7.5YR7/8 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 64.0 | 65.0 | Sand with Gravel, 10YR8/2 (very pale brown), loose, and wet. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.8-inch diameter | | |

**211-B-010**

Plant North -2642.383, Plant East -5151.421 10/5/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.5 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | Fill |
| 2.5 | 14.7 | Silt, 10YR7/1 (light gray) with some 10YR7/4 (very pale brown) mottling, soft, nonplastic, and moist | | HU1 |
| 14.7 | 16.0 | Clayey Silt with little Gravel, 10YR7/1 (light gray) with 10YR6/1 (gray) mottling, moderately hard, moderately plastic, and moist. Gravel is subrounded chert without iron patina, 0.3-inch diameter | | |
| 16.0 | 16.5 | Clayey Silt, 10YR7/1 (light gray) with 10YR6/1 (gray) mottling, moderately hard, moderately plastic, and moist0.3-inch diameter | | |
| 16.5 | 17.9 | Sand with little Gravel, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, rounded, chert grains. Gravel is rounded to subrounded chert with iron patina, 0.4- to 0.6-inch diameter | | HU2 |
| 17.9 | 19.0 | Clayey Silt with little Gravel, 10YR7/1 (light gray) with 10YR6/1 (gray) mottling, moderately hard, moderately plastic, and moist. Gravel is subrounded chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 19.0 | 20.0 | Crushed sample sleeve: 19.0 to 19.6 = Clayey Silt with little Gravel as above and 19.6 to 20.0 ft = Sand with Gravel and little Silt as below | | |
| 20.0 | 20.6 | Sand with Gravel and little Silt, 7.5YR6/6 (reddish yellow), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to rounded chert with iron patina, 4 mm- to 0.3-inch diameter | | |
| 20.6 | 21.2 | Silt with Sand, 10YR8/2 (very pale brown), soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 21.2 | 26.0 | Silt with Sand as above but with little Gravel. Gravel is subrounded to rounded chert without(?) iron patina, 0.3- to 0.4-inch diameter | | |
| 26.0 | 31.5 | Gravelly Sand with little Silt, 10YR7/6 (yellow) GRADING DOWN to 7.5YR7/4 (pink), dense, and very moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subangular to subrounded chert with iron patina, 4 mm- to 0.8-inch diameter | | |
| 31.5 | 37.0 | Silt with Sand, 7.5YR8/4 (pink) mottled with 7.5YR8/1 (white), very soft, nonplastic to slightly plastic, and moist. Sand is very fine quartz grains | | |

**211-B-010**

Plant North -2642.383, Plant East -5151.421 10/5/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 37.0 | 45.0 | Silt, 7.5YR7/6 (reddish yellow) with 7.5YR8/1 (white) mottling GRADING DOWN to 7.5YR8/1 (white) with 7.5YR7/4 (pink) mottling, soft, slightly plastic, and moist | | HU3 |
| 45.0 | 47.2 | Silty Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 47.2 | 49.9 | Silt with little Clay and some Gravel, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), moderately soft, plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.4- to 0.8-inch diameter | | |
| 49.9 | 50.2 | Sand with some Gravel, 10YR6/6 (brownish yellow), firm, and moist. Sand is fine quartz grains | | |
| 50.2 | 54.0 | Silt, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white) GRADING DOWN to 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, moderately plastic, and moist | | |
| 54.0 | 55.0 | Clay, 7.5YR7/4 (pink) with some 7.5YR8/1 (white) mottling, moderately hard, plastic, and moist | | |
| 55.0 | 56.1 | Clay as above | | |
| 56.1 | 59.5 | Silt with Sand, 7.5YR7/4 (pink) GRADING DOWN to 7.5YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 59.5 | 60.0 | Sand, 10YR8/3 (very pale brown), lightly consolidated, and moist. Sand is very fine quartz grains | | HU4 |
| 60.0 | 60.9 | Sand as above but colored 7.5YR7/4 (pink) | | |
| 60.9 | 62.5 | Sand as 59.5 to 60.0 ft but colored 7.5YR8/2 (pinkish white) GRADING DOWN to 7.5YR8/1 (white) | | |
| 62.5 | 64.2 | Sand with some Gravel, 10YR8/1 (white) GRADING DOWN to 10YR8/3 (very pale brown), firm, and wet. Sand is 90% very fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subangular to subrounded chert without iron patina, 4 mm- to 0.4-inch diameter | | |
| 64.2 | 65.0 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |

**211-B-011**

Plant North -2642.307, Plant East -5120.984 10/8/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.1 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | Fill |
| 2.1 | 13.7 | Silt, 10YR7/1 (light gray) with 10YR7/4 (very pale brown) mottling, soft, nonplastic, and moist | | HU1 |
| 13.7 | 15.4 | Silt with some Gravel and little Clay, 10YR7/2 (light gray), moderately soft, moderately plastic, and moist. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter | | |
| 15.4 | 16.4 | Sandy Gravel, 10YR6/3 (pale brown), dense, and moist. Gravel is subrounded chert with iron patina, 0.3- to 0.5-inch diameter. Sand is fine quartz grains | | |
| 16.4 | 18.2 | Silt with some Gravel and little Clay, 10YR7/2 (light gray), moderately soft, moderately plastic, and moist. Gravel is subangular chert without iron patina, 0.4- to 0.5-inch diameter | | |
| 18.2 | 21.9 | Gravelly Sand with little Silt, 7.5YR7/4 (pink), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to rounded chert with and without iron patina, 0.3- to 0.6-inch diameter | | HU2 |
| 21.9 | 22.4 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 22.4 | 24.6 | Silt, 10YR8/6 (yellow) mottled with 10YR8/1 (white), soft, slightly plastic, and moist | | |
| 24.6 | 29.2 | Sandy Silt with little Gravel, 10YR7/3 (very pale brown), moderately soft, nonplastic, and moist. Gravel is subrounded chert without iron patina, 0.6- to 1.0-inch diameter | | |
| 29.2 | 31.6 | Sandy Gravel with little Silt, 7.5YR7/4 (pink) with some 7.5YR5/1 (gray) staining (manganese?), dense, and moist. Gravel is subangular to subrounded chert without(?) iron patina, 0.3- to 1.0-inch diameter. Sand is 75% fine quartz grains and 25% coarse to very coarse, subrounded to rounded, chert grains | | |
| 31.6 | 32.2 | Sand, 7.5YR7/8 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 32.2 | 34.3 | Silt with little Clay, 7.5YR7/6 (reddish yellow) with little 7.5YR8/1 (white) mottling, soft, nonplastic, and moist | | |
| 34.3 | 40.0 | Silt, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), very soft, nonplastic, and moist | | |
| 40.0 | 40.8 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist | | |
| 40.8 | 42.0 | Silt as 34.3 to 40.0 ft | | |

**211-B-011**

Plant North -2642.307, Plant East -5120.984 | 10/8/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 42.0 | 42.4 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white) and 2.5YR6/8 (light red), moderately soft, slightly plastic, and moist | | HU3 |
| 42.4 | 45.9 | Silt, 7.5YR7/4 (pink) GRADING DOWN to 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, nonplastic, to slightly plastic, and moist | | |
| 45.9 | 50.1 | Silt with Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, nonplastic to slightly plastic, and moist. Sand is very fine quartz grains | | |
| 50.1 | 51.6 | Sand, 10YR8/1 (white) GRADING DOWN to 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 51.6 | 52.8 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 52.8 | 54.4 | Sandy Silt, 7.5YR7/3 (pink), soft, nonplastic, and moist | | |
| 54.4 | 58.0 | Silt with Clay, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, moderately hard, moderately plastic, and moist | | |
| 58.0 | 60.3 | Silt with Sand, 10YR8/2 (very pale brown) GRADING DOWN to 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 60.3 | 62.5 | Sand, 10YR8/1 (white), lightly consolidated, and moist. Sand is very fine quartz grains | | HU4 |
| 62.5 | 62.7 | Gravel with Sand and Silt, 10YR7/8 (yellow), firm, and moist. Gravel is subrounded chert with(?) iron patina, 0.6- to 1.0-inch diameter. Sand is very fine quartz sand | | |
| 62.7 | 63.1 | Sand, 10YR8/1 (white), loosely consolidated, and moist. Sand is fine quartz grains | | |
| 63.1 | 63.3 | Silty Clay, 10YR7/3 (very pale brown), soft, plastic, and moist | | |
| 63.3 | 67.5 | Sand, 10YR8/2 (very pale brown) with 7.5YR7/8 (reddish yellow) laminations, firm, and moist. Sand is fine quartz grains | | |

**211-B-012**

Plant North -2642.287, Plant East -5091.257 10/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.1 | Fill: Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.5-inch diameter | | Fill |
| 3.1 | 15.2 | Silt, 10YR7/2 (light gray) mottled with 10YR7/4 (very pale brown), soft, nonplastic to slightly plastic, and moist | | HU1 |
| 15.2 | 18.6 | Silt with little Clay and little Gravel, 10YR7/2 (light gray) with some 10YR7/3 (very pale brown) mottling, moderately hard, moderately plastic, and moist. Gravel is rounded to subangular chert without iron patina, 0.3-inch diameter | | |
| 18.6 | 18.9 | Gravelly Sand with little Silt, 10YR5/4 (yellowish brown), firm, and slightly moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert without(?) iron patina, 4 mm- to 0.4-inch diameter | | HU2 |
| 18.9 | 19.9 | Silty Sand with some Gravel, 10YR7/2 (light gray), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter | | |
| 19.9 | 21.4 | Silty Sand with little Gravel, 7.5YR7/2 (pinkish gray), firm, and moist. Sand consists of 70% fine quartz grains and 30% very coarse, subrounded, chert grains. Gravel is subrounded chert without(?) iron patina, 4 mm- to 0.3-inch diameter | | |
| 21.4 | 22.6 | Sand, 7.5YR7/6 (reddish yellow) GRADING DOWN to 10YR7/6 (yellow) mottled with 10YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 22.6 | 23.6 | Gravelly Sand with Silt, 10YR6/6 (brownish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.4- to 0.8-inch diameter | | |
| 23.6 | 25.1 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 25.1 | 25.9 | Silt with Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 25.9 | 28.1 | Sand with Gravel, 7.5YR6/8 (reddish yellow) with some 7.5YR8/1 (white) mottling, firm to dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 4 mm- to 0.8-inch diameter | | |
| 28.1 | 29.1 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 29.1 | 30.0 | Sand with Gravel as 25.9 to 28.1 ft | | |

**211-B-012**

Plant North -2642.287, Plant East -5091.257 10/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 30.0 | 32.1 | Sand with Gravel, 10YR6/4 (light yellowish brown), firm to dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded chert with(?) iron patina, 0.3- to 0.9-inch diameter | | |
| 32.1 | 35.6 | Silt, 7.5YR7/4 (pink), soft, moderately plastic, and moist | | HU3 |
| 35.6 | 37.5 | Silt with Sand, 10YR8/3 (very pale brown), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 37.5 | 44.9 | Silt GRADING DOWN to Silt with a little Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic to plastic, and moist | | |
| 44.9 | 48.1 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), very soft, moderately plastic, and moist | | |
| 48.1 | 48.6 | Silty Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | |
| 48.6 | 50.1 | Silt as 44.9 to 48.1 ft | | |
| 50.1 | 50.8 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 50.8 | 51.2 | Clay, 7.5YR6/4 (light brown) mottled with 7.5YR8/1 (white), moderately hard, plastic, and moist | | |
| 51.2 | 54.6 | Silt with Clay, 7.5YR8/1 (white) with 7.5YR7/6 (reddish yellow) mottling, moderately soft, moderately plastic, and moist | | |
| 54.6 | 55.6 | Clay as 50.8 to 51.2 ft | | |
| 55.6 | 57.4 | Silt with some Sand, 10YR8/3 (very pale brown), soft, slightly plastic, and moist. Sand is fine quartz grains | | |
| 57.4 | 62.7 | Sand, 10YR8/3 (very pale brown), firm, and wet. Sand is fine quartz grains | | HU4 |
| 62.7 | 65.0 | Sand with Gravel, 10YR8/3 (very pale brown), firm, and wet. Sand is 80% fine quartz grains and 20% coarse, rounded, chert grains. Gravel is rounded to subrounded chert without iron patina, 4 mm- to 0.5-inch diameter | | |

**211-B-013**

Plant North -2642.137, Plant East -5057.047 10/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.5 | Gravely Sand with some Silt, 2.5YR6/6 (light red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 0.3- to 1.0-inch diameter (common fill material at PGDP) | | Fill |
| 2.5 | 13.5 | Silt, 10YR7/1 (light gray) with some 10YR6/6 (brownish yellow) mottling, soft, nonplastic to slightly plastic, and moist | | HU1 |
| 13.5 | 16.5 | Silt with little Clay and with little Gravel, 10YR7/2 (light gray), hard, slightly plastic, and slightly moist. Gravel is subrounded chert without iron patina, 0.3-inch diameter | | |
| 16.5 | 17.5 | Sandy Gravel with Silt, 7.5YR7/2 (light gray), dens, and moist. Gravel is subrounded chert without iron patina, 0.3- to 0.4-inch diameter. Sand is fine grained | | HU2 |
| 17.5 | 20.0 | No recovery | | No Recovery |
| 20.0 | 21.3 | Sand with some Gravel, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with (?) iron patina, 4-mm to 1.0-inch diameter | | HU2 |
| 21.3 | 21.7 | Silt, 7.5YR8/4 (pink), moderately hard, moderately plastic, and moist | | |
| 21.7 | 21.8 | Sand, 7.5YR8/4 (pink), firm, and moist. Sand is very fine quartz grains. | | |
| 21.8 | 23.7 | Silt with little Clay, 7.5YR7/6 (reddish yellow) with 7.5YR7/1 (light gray) mottling, soft, moderately plastic, and moist | | |
| 23.7 | 25.0 | Silt, 7.5YR8/3 (pink) with 7.5YR8/1 (white) mottling, soft, plastic, and moist | | |
| 25.0 | 25.9 | Silty Sand, 10YR7/4 (very pale brown) with little 10YR8/1 (white) mottling, firm, and moist. Sand is very fine quartz grains | | |
| 25.9 | 26.7 | Sand with some Gravel, 10YR7/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without (?) iron patina, 4-mm to 0.3-inch diameter | | |
| 26.7 | 27.6 | Silty Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 27.6 | 27.9 | Gravelly Medium Sand, 7.5YR6/6 (reddish yellow), loose, and moist. Gravel is subrounded chert without iron patina, 0.3-inch diameter | | |
| 27.9 | 28.5 | Silt, 10YR7/3 (very pale brown), moderately hard, moderately plastic, and moist | | |
| 28.5 | 29.7 | Silty Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |

**211-B-013**

Plant North -2642.137, Plant East -5057.047 10/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 29.7 | 32.1 | Gravel with Silt, 10YR8/2 (very pale brown), dense, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 1.0-inch diameter | | |
| 32.1 | 33.1 | Sand with blebs of Silt, 10YR7/3 (very pale brown), firm, and moist. Sand is very fine quartz grains | | HU3 |
| 33.1 | 33.8 | Sand with Gravel, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is rounded to subrounded chert without iron patina, 4-mm to 0.4-inch diameter | | |
| 33.8 | 34.5 | Sand, 10YR8/2 (very pale brown), lightly consolidate, and moist. Sand is fine quartz grains | | |
| 34.5 | 34.9 | Gravelly Sand as 27.6 to 27.9 ft but colored 7.5YR7/4 (pink) | | |
| 34.9 | 35.4 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 35.4 | 36.0 | Sand with Gravel as 33.1 to 33.8 ft | | |
| 36.0 | 36.8 | Sandy Silt with some Gravel, 10YR7/3 (very pale brown) with little 2.5YR7/8 (light red) staining, soft, nonplastic, and moist. Sand is fine grained. Gravel is rounded to subrounded chert without iron patina, 0.5- to 1.0-inch diameter | | |
| 36.8 | 37.4 | Sand with Gravel as 33.1 to 33.8 ft | | |
| 37.4 | 42.4 | Silt, 10YR8/2 (very pale brown) with some 2.5YR7/8 (light red) staining, soft, nonplastic to slightly plastic, and moist | | |
| 42.4 | 43.8 | Silt with little Clay, 7.5YR7/3 (pink) mottled with 7.5YR7/1 (light gray), soft, moderately plastic, and moist | | |
| 43.8 | 47.6 | Silt, 10YR8/2 (very pale brown) with laminations of 10YR7/6 (yellow) and 7.5YR7/6 (reddish yellow), moderately soft, moderately plastic, and moist | | |
| 47.6 | 48.2 | Sand, 10YR8/2 (very pale brown) GRADING DOWN to 5YR7/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains | | |
| 48.2 | 50.0 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR7/1 (light gray), soft, moderately plastic, and moist | | |
| 50.0 | 52.4 | Sand, 10YR8/2 (very pale brown) with 7.5YR7/6 (reddish yellow) staining, firm, and moist. Sand is very fine quartz grains | | |
| 52.4 | 59.5 | Slightly Clayey Silt, 7.5YR8/4 (pink) with 7.5YR8/1 (white) mottling, soft, moderately plastic, and moist | | |
| 59.5 | 62.9 | Sand, 5YR7/6 (reddish yellow), lightly consolidated, and very moist. Sand is very fine quartz grains | | |

**211-B-013**

Plant North -2642.137, Plant East -5057.047 10/4/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 62.9 | 65.0 | Sandy Gravel, 7.5YR7/6 (reddish yellow), loose, and wet. Gravel is subrounded to subangular chert with iron patina, 0.3- to 1.0-inch diameter. Sand consists of 80% fine grains and 20% of coarse to very coarse, rounded, chert grains | | HU4 |

**211-B-015**

Plant North -2607.931, Plant East -5163.515 10/16/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 3.7 | Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.4- to 1.0-inch diameter | | Fill |
| 3.7 | 13.7 | Silt, 10YR7/1 (light gray) with little 10YR7/6 (yellow) mottling, GRADING DOWN to 10YR7/6 (yellow) with 10YR7/1 (light gray) mottling and streaks of 10YR3/1 (very dark gray) (manganese?), soft, nonplastic, and moist | | HU1 |
| 13.7 | 17.0 | Silt with Clay and little Gravel, 10YR7/1 (light gray), moderately soft to moderately hard, slightly plastic, and moist. Gravel is subrounded to rounded chert without iron patina, 0.4- to 0.5-inch diameter | | |
| 17.0 | 17.4 | Sand with Gravel, 7.5YR7/3 (pink), dense, and moist. Sand is 80% fine quartz grains and 20% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.4-inch diameter | | HU2 |
| 17.4 | 17.7 | Sand, 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 17.7 | 18.0 | Sand with Gravel as 17.0 to 17.4 ft | | |
| 18.0 | 18.3 | Silt with Clay and little Gravel as 13.7 to 17.0 ft | | |
| 18.3 | 21.5 | Sand with Gravel and little Silt, 10YR6/4 (light yellowish brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with and without iron patina, 0.3- to 0.8-inch diameter | | |
| 21.5 | 22.4 | Sand, 10YR7/6 (yellow) GRADING DOWN to 10YR8/1 (white), dense GRADING DOWN to firm, and moist. Sand is fine quartz grains | | |
| 22.4 | 23.9 | Sand with Gravel and little Silt as 18.3 to 21.5 ft | | |
| 23.9 | 24.5 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |
| 24.5 | 29.5 | Silty Sand, 10YR8/1 (white) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 29.5 | 31.8 | Sand with Gravel, 10YR6/6 (brownish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with(?) iron patina, 0.3- to 0.6-inch diameter | | |
| 31.8 | 32.6 | Sand with Gravel and little Silt, , 10YR6/6 (brownish yellow), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with(?) iron patina, 0.3- to 0.6-inch diameter | | |
| 32.6 | 33.8 | Silt with little Clay, 7.5YR7/4 (pink), very soft, moderately plastic, and moist | | |

**211-B-015**

Plant North -2607.931, Plant East -5163.515 10/16/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 33.8 | 35.7 | Silt with little Clay, 7.5YR7/4 (pink) with some 7.5YR8/1 (white) mottling, soft, plastic, and moist | | HU3 |
| 35.7 | 39.0 | Silt with Sand, 7.5YR7/6 (reddish yellow) with some 7.5YR8/1 (white) mottling, moderately soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 39.0 | 41.0 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately hard to moderately soft, moderately plastic, and moist | | |
| 41.0 | 42.5 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), moderately hard to moderately soft, moderately plastic, and moist | | |
| 42.5 | 45.0 | Silt, 7.5YR6/6 (reddish yellow) with some 7.5YR8/1 (white) mottling, hard, nonplastic, and moist | | |
| 45.0 | 50.0 | Silt with Sand, 10YR7/4 (very pale brown) with some 10YR8/1 (white) mottling, moderately hard, nonplastic, and moist. Sand is very fine quartz grains | | |
| 50.0 | 52.0 | Silt, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), moderately soft, slightly plastic, and moist | | |
| 52.0 | 52.5 | Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) mottling, firm, and moist. Sand is very fine quartz grains | | |
| 52.5 | 57.7 | Silt, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately hard GRADING DOWN to hard, nonplastic, and moist | | |
| 57.7 | 59.8 | Silt with Sand, 7.5YR7/3 (pink) mottled with 7.5YR8/1 (white), soft, moderately plastic, and moist. Sand is very fine quartz grains | | |
| 59.8 | 62.1 | Interbedded Very Fine Sand [10YR8/1 (white), firm, and moist] AND Silt with Very Fine Sand [7.5YR7/4 (pink), soft, moderately plastic, and moist] | | |
| 62.1 | 62.5 | Sand, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | HU4 |

**211-B-016**

Plant North -2624.624, Plant East -5148.039 10/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.5 | Gravelly Sand, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is chert with iron patina, 0.3- to 1.0-inch diameter | | Fill |
| 2.5 | 12.9 | Silt, 10YR7/2 (light gray) with little 10YR7/4 (very pale brown) mottling GRADING DOWN to 10YR6/3 (pale brown), soft, nonplastic, and moist | | HU1 |
| 12.9 | 13.6 | Sand, 10YR8/3 (very pale brown), dense, and moist. Sand is very fine quartz grains | | |
| 13.6 | 15.2 | Silt with Clay and some Gravel, 10YR7/4 (very pale brown) GRADING DOWN to 10YR7/2 (light gray), moderately hard/stiff, slightly plastic, and moist | | |
| 15.2 | 16.0 | Gravelly Sand, 10YR6/4 (light yellowish brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 4 mm- to 0.4-inch diameter | | |
| 16.0 | 18.8 | Silt with little Clay and little Gravel, 10YR7/1 (light gray), moderately soft, slightly plastic, and moist. Gravel is subrounded chert without iron patina, 0.3- to 0.7-inch diameter | | |
| 18.8 | 20.2 | Gravelly Sand with Silt, 10YR7/3 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.7- to 1.2-inch diameter AND subangular to subrounded chert with iron patina, 0.3- to 0.7-inch diameter | | HU2 |
| 20.2 | 21.5 | Sand with Gravel, 7.5YR7/4 (pink), dense, and moist. Sand is 70% fine quartz grains and 30% coarse-to-very-coarse, subrounded chert grains. Gravel is subangular to subrounded chert with(?) iron patina, 0.3-inch diameter | | |
| 21.5 | 22.6 | Sand, 10YR8/2 (very pale brown) with 10YR7/6 (yellow) mottling, firm, and moist. Sand is fine quartz grains | | |
| 22.6 | 23.4 | Sand with Gravel, 10YR7/4 (very pale brown), dense and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with and without iron patina, 0.3-inch diameter | | |
| 23.4 | 23.8 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 23.8 | 24.1 | Sandy Gravel, 10YR8/2 (very pale brown), dense, and moist. Gravel is subrounded chert with and without iron patina, 0.4-inch diameter. Sand is fine quartz grains | | |
| 24.1 | 29.0 | Silt with Sand (very fine quartz grains), GRADING DOWN to Sand (very fine quartz grains), 10YR8/2 (very pale brown) with 10YR7/6 (yellow) and 7.5YR7/6 (reddish yellow) laminations, soft to moderately firm, nonplastic, and moist | | |

**211-B-016**

Plant North -2624.624, Plant East -5148.039 10/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 29.0 | 31.4 | Sandy Gravel GRADING DOWN to Sandy Gravel with little Silt, 7.5YR6/4 (light brown), dense, and moist. Gravel is subrounded to subangular chert with iron patina, 0.3- to 1.0-inch diameter. Sand is 80% fine quartz grains and 20% coarse-to-very-coarse, subrounded chert grains | | |
| 31.4 | 36.3 | Silt, 7.5YR7/4 (pink) with some 7.5YR8/1 (white) mottling GRADING DOWN to 10YR7/4 (very pale brown) with some 10YR8/1 (white) mottling, very soft to soft, nonplastic to moderately plastic, and moist | | HU3 |
| 36.3 | 39.3 | Silt, 10YR7/4 (very pale brown) with 10YR8/1 (white) mottling GRADING DOWN to 10YR8/2 (very pale brown) with 7.5YR7/4 (pink) mottling, moderately soft, nonplastic, and moist | | |
| 39.3 | 40.6 | Silty Sand, 10YR7/3 (very pale brown) GRADING DOWN to 10YR7/6 (yellow) with 10YR8/1 (white) mottling, firm, and moist. Sand is very fine quartz grains | | |
| 40.6 | 41.0 | Sand, 7.5YR7/6 (reddish yellow), firm and moist. Sand is fine quartz grains | | |
| 41.0 | 45.6 | Clayey Silt, 7.5YR7/4 (pink) with 7.5YR8/1 (white) mottling, moderately hard, plastic, and moist | | |
| 45.6 | 47.4 | Silt with Sand, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains. Contains trace rounded chert gravel (without iron patina), 0.6- to 1.2-inch diameter | | |
| 47.4 | 48.0 | Sand, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is fine quartz grains | | |
| 48.0 | 51.5 | Silt with little Clay, 7.5YR8/1 (white) with 7.5YR7/4 (pink) mottling, moderately soft, moderately plastic, and moist | | |
| 51.5 | 53.4 | Silt with Sand, 7.5YR8/1 (white) mottled with 7.5YR7/4 (pink), soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 53.4 | 58.5 | Silt with little Clay, 7.5YR7/6 (reddish yellow) with 7.5YR8/1 (white) mottling, moderately hard, slightly plastic, and moist | | |
| 58.5 | 62.3 | Silt with Sand (very fine quartz grains) interbedded with Silty Sand (very fine quartz grains), 7.5YR8/1 (white) with 7.5YR7/7 (reddish yellow) laminations and mottling, soft/firm, nonplastic to slightly plastic, and moist | | |
| 62.3 | 63.9 | Sand, 10YR8/1 (white), firm, moist to loose, and wet. Sand is fine quartz grains | | |

**211-B-016**

Plant North -2624.624, Plant East -5148.039 10/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 63.9 | 64.2 | Sandy Gravel, 10YR8/2 (very pale brown), loose, and wet. Gravel is subrounded to subangular chert with and without iron patina, 4 mm- to 0.5-inch diameter. Sand is fine quartz grains | | HU4 |
| 64.2 | 65.0 | Sand with some Gravel and blebs of Silt, 10YR8/1 (white) with an interbed of 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | |

**211-B-017**

Plant North -2607.459, Plant East -5258.754 10/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.8 | Gravely Sand, 5YR6/6 (reddish yellow), dense, and moist. Sand is fine grained quartz. Gravel is subangular to subrounded chert with iron patina, 0.3- to 0.7-inch diameter | | Fill |
| 1.8 | 2.2 | Sandy Gravel, 10YR7/1 (light gray), dense, and moist. Gravel is subrounded limestone, 4mm- to 0.5-inch diameter (dense gravel aggregate/DGA). Sand is coarse, subangular limestone | | |
| 2.2 | 4.1 | Gravelly Sand as 0.0 to 1.8 ft | | |
| 4.1 | 10.3 | Silt, 10YR7/2 (light gray) with little 10YR7/4 (very pale brown) mottling, soft, nonplastic, and moist | | HU1 |
| 10.3 | 11.5 | Sand, 10YR6/6 (brownish yellow), dense, and moist. Sand is very fine quartz grains | | |
| 11.5 | 12.7 | Gravelly Sand, 7.5YR6/4 (light brown), dense, and moist. Sand is 90% fine quartz grains and 10% coarse, subrounded, chert grains. Gravel is subrounded chert without (?) iron patina, 0.3- to 1.0-inch diameter | | |
| 12.7 | 15.2 | Silt with little Clay and little Gravel, 10YR7/3 (very pale brown), moderately hard, nonplastic, and moist. Gravel is subrounded chert without iron patina | | |
| 15.2 | 17.6 | Silt with Gravel and little Clay, 10YR7/3 (very pale brown) GRADING DOWN to 10YR7/1 (light gray), moderately hard, nonplastic, and moist. Gravel is subrounded chert without iron patina, 0.3- to 1.0-inch diameter | | |
| 17.6 | 18.1 | Sand, 10YR7/4 (very pale brown), firm and moist. Sand is fine to medium, subrounded, quartz grains | | HU2 |
| 18.1 | 18.6 | Sand, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 18.6 | 19.1 | Sand with some Gravel, 10YR7/4 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without (?) iron patina, 0.3- to 0.4-inch diameter | | |
| 19.1 | 21.8 | Sand with some Gravel, 10YR8/2 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without (?) iron patina, 4 mm- to 0.4-inch diameter | | |
| 21.8 | 22.5 | Sand with some Gravel, 7.5YR6/4 (light brown), dense, and moist. Sand is 70% fine quartz grains and 30% coarse-to-very-coarse, subrounded chert grains. Gravel is subrounded to rounded chert without (?) iron patina, 0.3- to 0.4-inch diameter | | |
| 22.5 | 24.9 | Sand with little Gravel, 10YR7/1 (light gray) mottled with 10YR7/3 (very pale brown), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert, with and without iron patina, 4 mm- to 0.6-inch diameter | | |

**211-B-017**

Plant North -2607.459, Plant East -5258.754 10/17/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 24.9 | 25.8 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 25.8 | 27.0 | Silt, 10YR8/2 (very pale brown) with 7.5YR7/6 (reddish yellow) laminations, moderately soft, nonplastic, and moist | | |
| 27.0 | 28.1 | Sand, 10YR8/2 (very pale brown), lightly consolidated, and moist. Sand is 90% fine quartz grains and 10% coarse, rounded, chert grains | | |
| 28.1 | 28.8 | Silt as 25.8 to 27.0 ft | | |
| 28.8 | 29.5 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 29.5 | 31.0 | Gravelly Sand, 10YR7/3 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.6-inch diameter | | |
| 31.0 | 31.5 | Silt, 10YR8/2 (very pale brown), soft, plastic, and moist | | |
| 31.5 | 36.4 | Gravelly Sand as 29.5 to 31.0 ft | | |
| 36.4 | 39.0 | Silty Sand, 10YR8/2 (very pale brown) with some 7.5YR7/6 (reddish yellow) laminations, firm, and moist. Sand is very fine quartz grains | | HU3 |
| 39.0 | 40.2 | Silt with little Clay, 10YR7/2 (light gray) mottled with 10YR7/4 (very pale brown), moderately soft, moderately plastic, and moist | | |
| 40.2 | 47.0 | Silt with some Clay, 7.5YR7/4 (pink) with some 7.5YR8/1 (white) mottling, moderately hard, slightly plastic, and moist | | |
| 47.0 | 53.9 | Silt, 7.5YR8/1 (white) mottled with 7.5YR7/6 (reddish yellow), moderately hard, slightly plastic, and moist | | |
| 53.9 | 56.7 | Silt, 7.5YR6/8 (reddish yellow), hard, nonplastic, and moist | | |
| 56.7 | 58.2 | Silt, 7.5YR8/1 (white), moderately hard, nonplastic, and moist | | |
| 58.2 | 59.0 | Silt with Sand, 10YR8/3 (very pale brown) with 7.5YR7/6 (reddish yellow) mottling, soft, nonplastic, and moist. Sand is fine quartz grains | | |
| 59.0 | 62.5 | Sand with a few blebs of Silt, 10YR8/2 (very pale brown) with some 7.5YR7/6 (reddish yellow) staining and mottling, firm and moist. Sand is fine quartz grains. Silt blebs are 10YR8/2 (very pale brown), soft, plastic, and moist. | | HU4 |

**211-B-018**

Plant North -2630.55, Plant East -5241.133 10/18/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.4 | Gravelly Sand with little Silt, 2.5YR6/6 (light red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 4-mm to 0.4-inch diameter | | FILL |
| 1.4 | 2.0 | Gravel, 10YR7/1 (light gray), dense, and moist. Gravel is subangular limestone, 4-mm to 0.3-inch diameter: dense gravel aggregate/DGA | | |
| 2.0 | 2.6 | Gravelly Sand, 2.5YR6/6 (light red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded chert with iron patina, 4-mm to 0.4-inch diameter | | |
| 2.6 | 12.1 | Silt, 10YR7/1 (light gray) with little 10YR7/4 (very pale brown) mottling GRADING DOWN to 7.5YR7/6 (reddish yellow), soft, nonplastic, and moist | | HU1 |
| 12.1 | 12.7 | Sand, 10YR8/2 (very pale brown), dense, and moist. Sand is very fine quartz grains | | |
| 12.7 | 14.0 | Sand, 10YR7/6 (yellow), firm, and moist WITH thin Silt interbeds, 10YR8/2 (very pale brown), soft, plastic, and moist. Sand is fine quartz grains | | |
| 14.0 | 14.4 | Sandy Silt with some Gravel, 7.5YR6/6 (reddish yellow), soft, nonplastic, and moist | | |
| 14.4 | 17.5 | Silt with little Clay and Gravel, 10YR7/3 (very pale brown), moderately soft, plastic, and moist. Gravel is subrounded chert without iron patina, 0.4-inch diameter | | |
| 17.5 | 18.6 | Silt with Sand and Gravel, 10YR7/1 (light gray), soft, nonplastic, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with and without iron patina, 0.3- to 0.6-inch diameter | | |
| 18.6 | 23.9 | Sand with Gravel and little Silt, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is 70% fine quartz grains and 30% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert with iron patina, 0.3- to 0.8-iinch diameter | | HU2 |
| 23.9 | 25.8 | Sand, 10YR8/4 (very pale brown), firm-to-lightly-consolidated, and moist. Sand is fine quartz grains | | |
| 25.8 | 26.8 | Silt with little Sand, 10YR7/6 (yellow) mottled with 10YR8/1 (white), soft, moderately plastic, and moist. Sand is fine quartz grains | | |
| 26.8 | 27.4 | Gravelly Sand, 10YR8/2 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subangular to subrounded chert with(?) iron patina, 0.5- to 0.6-inch diameter | | |
| 27.4 | 27.6 | Sand, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | |
| 27.6 | 30.3 | Gravelly Sand as 26.8 to 27.4 ft | | |

**211-B-018**

Plant North -2630.55, Plant East -5241.133 10/18/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 30.3 | 31.5 | Sand, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains | | |
| 31.5 | 32.4 | Sand with Gravel, 10YR8/1 (white), firm, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 32.4 | 39.0 | Silt with some Sand, 10YR8/1 (white), soft, nonplastic to moderately plastic, and moist. Sand is very fine quartz grains | | HU3 |
| 39.0 | 43.2 | Silt with some Clay, 10YR8/1 (white) mottled with 10YR7/6 (yellow), soft, plastic, and moist | | |
| 43.2 | 51.6 | Silt with some Clay, 7.5YR7/4 (pink) mottled with 7.5YR8/1 (white), moderately soft, moderately plastic, and moist | | |
| 51.6 | 52.5 | Silt with Sand (soft, moderately plastic, and moist) GRADING DOWN to Sand (firm and moist), 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white). Sand is very fine quartz grains | | |
| 52.5 | 55.5 | Silt with little Clay, 7.5YR6/6 (reddish yellow) with little 7.5YR8/1 (white) mottling, moderately hard/stiff, nonplastic to slightly plastic, and moist | | |
| 55.5 | 58.7 | Silty Sand, 10YR8/2 (very pale brown) with 10YR7/76 (yellow) laminations, firm, and moist. Sand is very fine quartz grains | | |
| 58.7 | 62.5 | Sand, 10YR8/4 (very pale brown), firm and moist to loose and wet. Sand is fine quartz grains but for interval of coarse, rounded, quartz grains at 62.0 to 62.1 ft | | HU4 |

**211-B-019**

Plant North -2603.36, Plant East -5105.973 10/18/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 2.2 | Gravelly Sand with little Silt, 2.5YR5/6 (red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 4 mm- to 0.5-inch diameter | | HU1 |
| 2.2 | 15.2 | Silt, 10YR7/1 (light gray) with little 10YR7/4 (very pale brown) GRADING DOWN to 10YR7/3 (very pale brown), soft, nonplastic, and moist | | |
| 15.2 | 18.3 | Silt with little Clay and little Gravel, 10YR7/1 (light gray) mottled with 10YR7/4 (very pale brown), moderately hard, slightly plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.9-inch diameter | | |
| 18.3 | 19.1 | Sand with Gravel, 10YR7/4 (very pale brown), dense, and moist. Sand is 70% fine quartz grains and 30% coarse, subrounded, chert grains. Gravel is subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | HU2 |
| 19.1 | 20.0 | Sand with trace of Gravel, 7.5YR7/6 (reddish yellow), dense, and moist. Sand is 85% fine quartz grains and 15% coarse, subrounded, chert grains. Gravel is chert, 0.3- to 0.5-inch diameter | | |
| 20.0 | 20.9 | Sand with Gravel as 18.3 to 19.1 ft | | |
| 20.9 | 21.3 | Silt with Sand, 10YR7/1 (light gray), moderately hard, nonplastic, and moist. Sand is very fine quartz grains | | |
| 21.3 | 22.5 | Sand with Gravel as 18.3 to 19.1 ft | | |
| 22.5 | 27.5 | Silty Sand, firm, and moist; interbedded with Silt with little Clay, moderately hard, slightly plastic, and moist; 10YR7/1 (light gray) mottled with 7.5YR7/6 (reddish yellow). Sand is very fine quartz grains | | |
| 27.5 | 28.2 | Silty Sand with Gravel, 10YR7/1 (light gray) mottled with 7.5YR7/6 (reddish yellow), firm, and moist. Sand is very fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.8-inch diameter | | |
| 28.2 | 28.5 | Silt with Sand, 10YR7/1 (light gray), moderately soft, moderately plastic, and moist. Sand is very fine quartz grains | | |
| 28.5 | 32.0 | Sand with Gravel and with little Silt, 7.5YR7/4 (pink), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter (and trace 1.0-inch diameter) | | |
| 32.0 | 42.3 | Silt, 10YR7/3 (very pale brown) GRADING DOWN to 10YR8/2 (very pale brown) with 10YR7/6 (yellow) laminations, soft to moderately soft, nonplastic to slightly plastic, and moist | | |

**211-B-019**

Plant North -2603.36, Plant East -5105.973 10/18/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 42.3 | 45.5 | Silt with little Clay, 7.5YR7/4 (pink) mottled with 7.5YR7/1 (white), moderately hard, slightly to moderately plastic, and moist | | HU3 |
| 45.5 | 46.5 | Silty Sand, 7.5YR6/6 (reddish yellow) with some 7.5YR8/1 (white) mottling, firm, and moist. Sand is very fine quartz grains | | |
| 46.5 | 48.5 | Sand with trace of Gravel, 7.5YR6/6 (reddish yellow) mottled with 7.5YR8/1 (white), firm, and moist. Sand is fine quartz grains. Gravel is subrounded chert without iron patina, 0.3- to 0.7-inch diameter | | |
| 48.5 | 50.3 | Silt, 10YR7/4 (very pale brown) mottled with 10YR8/1 (white), moderately hard, nonplastic, and moist | | |
| 50.3 | 52.2 | Silt, 10YR7/3 (very pale brown) mottled with 7.5YR7/6 (reddish yellow), soft, moderately plastic, and moist | | |
| 52.2 | 53.6 | Silty Sand, 10YR8/2 (very pale brown) mottled with 10YR7/6 (yellow), firm, and moist. Sand is very fine quartz grains | | |
| 53.6 | 57.7 | Silt, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), moderately soft, moderately plastic, and moist | | |
| 57.7 | 59.0 | Silty Sand, 10YR8/4 (very pale brown) mottled with 10YR8/1 (white), firm, and moist. Sand is very fine quartz grains | | |
| 59.0 | 59.6 | Silt with Sand, 10YR7/6 (yellow), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 59.6 | 67.5 | Sand, 10YR8/4 (very pale brown), lightly consolidated and moist TO loose and wet WITH a few blebs of Clay, 10YR8/2 (very pale brown), soft, plastic, and moist. Sand is fine quartz grains | | HU4 |

**211-B-020**

Plant North -2627.587, Plant East -5106.145 10/19/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 0.0 | 1.3 | Fill: Sand with Gravel and little Silt, 2.5YR6/6 (light red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.3-inch diameter | | Fill |
| 1.3 | 1.5 | Fill: Gravel, 10YR7/2 (light gray), loose, and moist. Gravel is subangular to subrounded limestone, 4 mm- to 0.5-inch diameter (dense gravel aggregate/DGA) | | |
| 1.5 | 2.6 | Fill: Sand with Gravel, 2.5YR6/6 (light red), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to rounded chert with iron patina, 0.3-inch diameter | | |
| 2.6 | 14.5 | Silt, 10YR7/1 (light gray) mottled with 10YR7/6 (yellow) GRADING DOWN at 13.1 ft to 10YR7/6 (yellow) mottled with 10YR5/4 (yellowish brown) and 10YR7/1 (light gray), soft, nonplastic, and moist | | HU2 |
| 14.5 | 16.7 | Silt with little Clay and little Gravel, 10YR7/1 (light gray), moderately soft, moderately plastic, and moist. Gravel is subrounded to subangular chert without iron patina, 4 mm- to 0.3-inch diameter | | |
| 16.7 | 18.3 | Silt with Gravel and little Clay, 10YR7/1 (light gray) mottled with 7.5YR7/4 (pink), moderately soft, moderately plastic, and moist. Gravel is subrounded chert without iron patina, 0.5- to 1.1 inch diameter | | |
| 18.3 | 20.0 | Clayey Silt with little Gravel, 10YR7/1 (light gray), moderately hard, plastic, and moist. Gravel is subangular to subrounded chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 20.0 | 20.2 | Gravelly Sand, 7.5YR6/4 (light brown), dense, and moist. Sand is 65% fine quartz grains and 35% coarse, subrounded, chert grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.5-inch diameter | | |
| 20.2 | 22.0 | Silt with Sand, 10YR8/2 (very pale brown) with some 10YR7/6 (yellow) mottling, soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 22.0 | 22.4 | Silt with Gravel and little Clay as at 16.7 to 18.3 ft but colored 7.5YR6/2 (pinkish gray) | | |
| 22.4 | 23.0 | Gravelly Sand as 20.0 to 20.2 ft | | |
| 23.0 | 24.2 | Silt, 10YR8/1 (white) mottled with 10YR8/3 (very pale brown), soft, nonplastic, and moist | | |
| 24.2 | 25.3 | Sand, 10YR8/1 (white) with 10YR7/4 (very pale brown) mottling, firm, and moist. Sand is fine quartz grains | | |

**211-B-020**

Plant North -2627.587, Plant East -5106.145 10/19/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 25.3 | 30.0 | Sand with some Gravel, 10YR8/2 (very pale brown) GRADING DOWN to 10YR6/6 (brownish yellow), dense, and moist. Sand is 85% fine quartz grains and 15% coarse to very coarse, subrounded, chert grains. Gravel is subrounded to subangular chert without iron patina, 0.3- to 0.4-inch diameter | | HU3 |
| 30.0 | 30.5 | Sand, 10YR8/3 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 30.5 | 31.9 | Gravelly Sand, 10YR7/4 (very pale brown), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with and without iron patina, 4 mm- to 0.8-inch diameter (poorly sorted) | | |
| 31.9 | 32.2 | Sand, 7.5YR7/6 (reddish yellow), firm, and moist. Sand is fine quartz grains | | |
| 32.2 | 37.5 | Silt with Sand, 7.5YR8/6 (reddish yellow), soft, nonplastic, and moist. Sand is fine quartz grains | | HU3 |
| 37.5 | 42.2 | Silt, 10YR7/4 (pink) with some 10YR8/1 (white) mottling, soft, nonplastic to moderately plastic, and moist | | |
| 42.2 | 44.2 | Silt with little Clay, 7.5YR7/4 (pink) with some 7.5YR6/6 (reddish yellow) mottling, moderately soft GRADING DOWN to soft, moderately plastic, and moist | | |
| 44.2 | 45.9 | Silt, 7.5YR7/6 (reddish yellow) with little 7.5YR8/1 (white) mottling, soft, plastic, and moist | | |
| 45.9 | 47.9 | Silt with Sand, 7.5YR7/6 (reddish yellow) mottled with 7.5YR8/1 (white), soft, nonplastic, and moist. Sand is very fine quartz grains | | |
| 47.9 | 50.6 | Sand, 10YR8/2 (very pale brown), firm, and moist. Sand is very fine quartz grains | | |
| 50.6 | 51.4 | Silt with Sand, 10YR8/2 (very pale brown), soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 51.4 | 52.3 | Silt with Clay, 7.5YR8/2 (pinkish white) mottled with 7.5YR7/4 (pink), soft, plastic, and moist | | |
| 52.3 | 52.9 | Silt with Sand, 10YR8/2 (very pale brown), soft, slightly plastic, and moist. Sand is very fine quartz grains | | |
| 52.9 | 53.6 | Sand, 10YR8/4 (very pale brown), firm, and moist. Sand is fine quartz grains | | |
| 53.6 | 57.6 | Silt, 7.5YR8/2 (pinkish white) with 7.5YR7/4 (pink) mottling, soft, plastic, and moist | | |
| 57.6 | 59.7 | Sand (fine quartz grains), 10YR8/6 (yellow), firm, and moist interbedded with Silt, 10YR8/3 (very pale brown), soft, nonplastic, and moist | | |
| 59.7 | 62.4 | Sand, 10YR7/6 (yellow), firm, and moist. Sand is fine quartz grains | | |

**211-B-020**

Plant North -2627.587, Plant East -5106.145 10/19/2012

| Start Depth (ft bgs) | End Depth (ft bgs) | Lithology | | Hydrogeologic Unit |
|---|---|---|---|---|
| 62.4 | 62.7 | Gravelly Sand, 10YR8/1 (white), dense, and moist. Sand is fine quartz grains. Gravel is subrounded to subangular chert with iron patina, 0.4- to 0.5-inch diameter | | HU4 |
| 62.7 | 65.0 | Sand, 10YR8/2 (very pale brown), firm and moist to loose and wet. Sand is fine quartz grains | | |

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# APPENDIX E

# SUMMARY OF SOILS VOC DATA FOR SWMU 211-A

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## SWMU 211-A VOC Analyes

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-001 | 8/29/2012 | 0.5 | 0.44 | U | 1.8 | U | 0.67 | U | 1.1 | U | 0.48 | U |
| | | 7.5 | 0.42 | U | 1.7 | U | 0.65 | U | 1 | U | 0.46 | U |
| | | 10.1 | 0.39 | U | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | (10.1)DUP | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 19.9 | 9.7 | | 1.4 | U | 0.54 | U | 0.84 | U | 0.39 | U |
| | | 24.9 | 4 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 25.5 | 14 | | 1.2 | U | 0.46 | U | 0.72 | U | 0.33 | U |
| | | 34.5 | 3.1 | J | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 35.5 | 0.45 | J | 1.3 | U | 0.5 | U | 0.78 | U | 0.36 | U |
| | | 44.5 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 46.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 50.1 | 0.37 | U | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 59 | 11 | | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | Average | | 3.4 | | *** | | *** | | *** | | *** | |
| 211-A-002 | 8/30/2012 | 4.5 | 2.1 | J | 1.8 | U | 0.69 | J | 1 | U | 0.47 | U |
| | | 6 | 23 | | 1.6 | U | 9.4 | J | 0.93 | U | 0.43 | U |
| | | 11 | 12 | | 1.6 | U | 3.2 | J | 0.92 | U | 0.42 | U |
| | | 16 | 0.34 | U | 1.4 | U | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 21 | 9.5 | | 1.5 | U | 2 | J | 0.88 | U | 0.4 | U |
| | | 25.5 | 0.47 | J | 1.5 | U | 0.55 | U | 0.85 | U | 0.39 | U |
| | | 32.5 | 10 | | 1.6 | U | 0.92 | J | 0.93 | U | 0.42 | U |
| | | (32.5)DUP | 2.4 | J | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 36.5 | **1,100** | | 27 | U | 11 | U | 8.9 | U | 30 | U |
| | | 40.5 | **880** | | 22 | U | 9.6 | U | 7.5 | U | 26 | U |
| | | 45.5 | **140** | | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 50.1 | 2.5 | J | 1.6 | U | 0.6 | U | 0.93 | U | 0.43 | U |
| | | 59.9 | 65 | | 2 | J | 0.61 | U | 0.96 | U | 0.44 | U |
| | 8/31/2012 | 62.5 | 8.7 | J | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | Average | | **161** | | 2.5 | | 2.0 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-003 | 9/12/2012 | 4 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 9 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 14 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 19 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | (21.5)DUP | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 21.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 28.5 | 0.31 | U | 1.3 | U | 0.48 | U | 0.75 | U | 0.34 | U |
| | | 34.9 | 8.7 | J | 1.6 | U | 0.6 | U | 0.95 | U | 0.43 | U |
| | | 39.5 | **110** | | 17 | | 1.8 | J | 0.83 | U | 0.38 | U |
| | | 40.1 | **80** | | 19 | | 0.85 | J | 0.94 | U | 0.43 | U |
| | | 48 | 52 | | 12 | | 1.2 | J | 0.89 | U | 0.41 | U |
| | | 54 | 4.4 | J | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 59 | 0.39 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.43 | U |
| | | 64 | 0.36 | U | 1.9 | J | 0.56 | U | 0.87 | U | 0.4 | U |
| | Average | | 18 | | 4.1 | | 0.5 | | *** | | *** | |
| 211-A-004 | 8/31/2012 | 4 | 0.39 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 9 | 0.38 | U | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 14 | 0.36 | U | 1.6 | J | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 16.5 | 0.33 | U | 18 | | 0.5 | U | 0.79 | U | 0.36 | U |
| | | 24.9 | **1,700** | | **1,600** | | 9.6 | U | 7.5 | U | 26 | U |
| | | 27 | **960** | | **970** | | 9.4 | J | 7.3 | U | 25 | U |
| | | 30.1 | **620** | | **900** | | 20 | J | 6.2 | U | 21 | U |
| | | 35.1 | **1,200** | | **1,400** | | 20 | J | 8.1 | U | 28 | U |
| | | 40.1 | **2,400** | | **4,400** | | 29 | J | 8.3 | U | 28 | U |
| | 9/4/2012 | 48.5 | 17 | U | **480** | | 9.9 | U | 7.7 | U | 26 | U |
| | | 53.5 | 33 | J | 110 | J | 10 | U | 8.2 | U | 28 | U |
| | | 59.9 | **97** | | 12 | | 10 | J | 1.1 | U | 0.51 | U |
| | | 61 | **160** | | 23 | | 14 | | 1.1 | U | 0.49 | U |
| | Average | | **552** | | **763** | | 9.1 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-005 | 9/4/2012 | 4 | 19 | U | 26 | U | 11 | U | 8.8 | U | 30 | U |
| | | 6 | **1,700** | | 24 | U | 15 | J | 8.2 | U | 28 | U |
| | | 14 | **88** | | 1.5 | U | 11 | | 0.88 | U | 7.6 | J |
| | | 15.1 | 35 | | 1.6 | U | 4.7 | J | 0.92 | U | 1.5 | J |
| | | (15.1)DUP | 42 | | 1.5 | U | 6.4 | J | 0.9 | U | 2 | J |
| | | 23.5 | 17 | | 9.3 | | 2 | J | 0.81 | U | 0.37 | U |
| | | 26 | 13 | | 1.3 | U | 2.2 | J | 0.75 | U | 0.35 | U |
| | | 34.9 | 54 | | 130 | | 1.4 | J | 0.88 | U | 0.4 | U |
| | | 35.5 | **190** | J | **840** | | 11 | U | 8.4 | U | 29 | U |
| | | 43.5 | **96** | J | **690** | | 10 | U | 7.9 | U | 27 | U |
| | | 45.5 | 71 | J | **550** | | 10 | U | 7.8 | U | 27 | U |
| | | 53 | 11 | | 8.8 | J | 0.6 | J | 0.86 | U | 0.4 | U |
| | | 55.5 | 6.5 | J | 3.2 | J | 0.84 | J | 0.95 | U | 0.43 | U |
| | | 60.5 | **120** | | 24 | | 7.1 | J | 0.9 | U | 0.41 | U |
| | Average | | **175** | | **163** | | 5.2 | | *** | | 5.9 | |
| 211-A-006 | 9/26/2012 | 4 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | (4)DUP | 1.8 | J | 1.7 | U | 0.65 | J | 0.98 | U | 0.45 | U |
| | | 9 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 14 | 0.38 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 18.5 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 23.5 | 0.32 | U | 1.3 | U | 0.49 | U | 0.77 | U | 0.35 | U |
| | | 29 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 32 | 1.1 | J | 1.3 | U | 0.49 | U | 0.77 | U | 0.35 | U |
| | | 39 | 13 | | 32 | | 0.83 | J | 0.97 | U | 0.44 | U |
| | | 40.5 | 8 | J | 22 | | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 49 | 8.7 | | 17 | | 0.51 | U | 0.8 | U | 0.37 | U |
| | | 51 | 7.1 | J | 9.5 | J | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 59.5 | 24 | | 7.2 | J | 1 | J | 1 | U | 0.48 | U |
| | | 61 | 52 | | 9.4 | J | 2.9 | J | 1.1 | U | 0.51 | U |
| | Average | | 8.3 | | 7.4 | | 0.6 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-008 | 9/20/2012 | 4 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | (9)DUP | 0.54 | U | 2.2 | U | 0.83 | U | 1.3 | U | 0.6 | U |
| | | 9 | 0.49 | U | 2 | U | 0.75 | U | 1.2 | U | 0.54 | U |
| | | 13.5 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 19 | 0.38 | U | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 24.9 | 0.45 | U | 1.9 | U | 0.69 | U | 1.1 | U | 0.5 | U |
| | | 29 | 0.4 | U | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 33.5 | 0.37 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 39 | 0.36 | U | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 41 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 49.9 | 0.37 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 53.5 | 5.3 | J | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 59 | 34 | | 6.5 | J | 0.67 | U | 1 | U | 0.48 | U |
| | | 61.5 | **130** | | 78 | | 4.2 | J | 1.1 | U | 0.52 | U |
| | Average | | 12 | | 6.8 | | 0.6 | | *** | | *** | |
| 211-A-009 | 9/20/2012 | 4 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.48 | U |
| | | 9 | 0.44 | U | 1.8 | U | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 14 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 19 | 8.7 | J | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 22.5 | 1.7 | J | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | (29)DUP | 13 | | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 29 | 11 | | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 34 | 2.4 | J | 2.5 | J | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 39.5 | **160** | J | 25 | U | 11 | U | 8.5 | U | 29 | U |
| | | 40.1 | **110** | | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 49 | 1.8 | J | 1.8 | U | 0.68 | U | 1.1 | U | 0.48 | U |
| | | 54 | 32 | | 3.6 | J | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 59.9 | **190** | | 38 | | 1.9 | J | 0.92 | U | 0.42 | U |
| | | 60.1 | 33 | | 3.3 | J | 0.64 | J | 0.93 | U | 0.43 | U |
| | Average | | 40 | | 4.8 | | 0.8 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-010 | 8/16/2012 | 4 | 0.39 | U | 1.6 | U | 0.6 | U | 0.95 | U | 0.43 | U |
| | | 9.5 | 0.46 | J | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 14.5 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 19.9 | 14 | | 1.4 | U | 11 | | 0.8 | U | 0.37 | U |
| | 9/13/2012 | 24 | 2.7 | J | 1.4 | U | 0.51 | U | 0.81 | U | 0.37 | U |
| | | 26 | 25 | | 1.5 | U | 0.91 | J | 0.89 | U | 0.41 | U |
| | | 33 | **790** | | 22 | U | 9.5 | U | 7.4 | U | 25 | U |
| | | 38.5 | **500** | | 26 | U | 11 | U | 8.6 | U | 29 | U |
| | | 40.1 | **280** | | 22 | U | 9.6 | U | 7.5 | U | 25 | U |
| | | 48 | 1.4 | J | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 52 | 0.32 | U | 1.3 | U | 0.49 | U | 0.76 | U | 0.35 | U |
| | 9/17/2012 | 59 | 15 | | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 60.5 | **120** | | 2.2 | J | 1.3 | J | 1.1 | U | 0.52 | U |
| | Average | | **135** | | 3.4 | | 2.3 | | *** | | *** | |
| 211-A-011 | 8/17/2012 | 4 | 0.39 | U | 1.6 | U | 0.6 | U | 0.93 | U | 0.43 | U |
| | | 9 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | (11)DUP | 0.39 | U | 1.6 | U | 0.6 | U | 0.95 | U | 0.43 | U |
| | | 11 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 19.5 | 0.39 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.43 | U |
| | | 20.1 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 27.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 30.5 | 0.35 | U | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 36.5 | 60 | | 17 | | 0.86 | J | 1.2 | U | 0.55 | U |
| | | 40.1 | **76** | | 20 | | 0.64 | U | 1 | U | 0.46 | U |
| | | 49.5 | 11 | | 2.9 | J | 0.67 | U | 1 | U | 0.48 | U |
| | | 51.5 | 3.2 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 59.9 | 8.3 | J | 19 | | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 62.5 | 8.6 | J | 28 | | 0.6 | U | 0.94 | U | 0.43 | U |
| | Average | | 12 | | 6.7 | | 0.3 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-012 | 9/17/2012 | 4 | 0.46 | U | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 9 | 0.4 | U | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 14 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | (19)DUP | 0.39 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.43 | U |
| | | 19 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 20.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 26.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 31 | 0.44 | U | 1.8 | U | 0.67 | U | 1.1 | U | 0.48 | U |
| | | 36.5 | 0.35 | U | 1.4 | U | 0.53 | U | 0.84 | U | 0.38 | U |
| | | 40.1 | 20 | | 23 | | 0.88 | J | 0.97 | U | 0.45 | U |
| | | 49 | 16 | | 11 | | 1.5 | J | 0.86 | U | 0.39 | U |
| | | 54 | 5.1 | J | 1.6 | J | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 59 | 12 | | 50 | | 1.2 | J | 1 | U | 0.46 | U |
| | | 64.5 | 14 | | 55 | | 1.3 | J | 0.94 | U | 0.43 | U |
| | Average | | 4.9 | | 11 | | 0.6 | | *** | | *** | |
| 211-A-013 | 9/4/2012 | 4.9 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 6.5 | 5.7 | J | 1.6 | U | 12 | | 0.96 | U | 0.44 | U |
| | | 14 | 42 | | 1.6 | U | 22 | | 0.93 | U | 3 | J |
| | | 18.5 | 0.37 | U | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 20.5 | 9.3 | | 1.4 | U | 2.1 | J | 0.84 | U | 0.38 | U |
| | | 26.5 | 3.3 | J | 1.4 | U | 0.92 | J | 0.81 | U | 0.37 | U |
| | | 30.1 | 22 | | 7.8 | J | 2.9 | J | 0.81 | U | 0.39 | J |
| | | 35.5 | 29 | | 5.1 | J | 1.3 | J | 0.87 | U | 0.4 | U |
| | | 44.5 | **170** | J | **350** | | 9.4 | U | 7.4 | U | 25 | U |
| | 9/5/2012 | 47.5 | **78** | J | **180** | J | 9.7 | U | 7.6 | U | 26 | U |
| | | 53.5 | 13 | | 11 | | 0.7 | J | 0.99 | U | 0.45 | U |
| | | 55.1 | 13 | | 12 | | 0.76 | J | 0.91 | U | 0.42 | U |
| | | 64 | 56 | | 13 | | 4.8 | J | 0.99 | U | 0.45 | U |
| | Average | | 34 | | 45 | | 4.4 | | *** | | 2.4 | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-014 | 9/5/2012 | 4 | 0.39 | U | 1.6 | U | 0.6 | U | 0.93 | U | 0.43 | U |
| | | 9 | 0.4 | U | 24 | | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 14 | 0.41 | U | 6.1 | J | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 19 | 0.33 | U | 1.4 | U | 0.51 | U | 0.8 | U | 0.36 | U |
| | | 24.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 29.5 | 0.31 | U | 1.7 | J | 0.48 | U | 0.75 | U | 0.35 | U |
| | | 34.5 | 18 | | 22 | | 1.1 | J | 0.88 | U | 0.4 | U |
| | | (36.5)DUP | 28 | | 43 | | 1.6 | J | 0.81 | U | 0.37 | U |
| | | 36.5 | 0.35 | U | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 42 | 59 | | **140** | | 3.5 | J | 0.84 | U | 0.38 | U |
| | | 45.1 | 24 | | 57 | | 0.93 | J | 0.78 | U | 0.36 | U |
| | | 50.5 | 26 | | 34 | | 0.6 | J | 0.87 | U | 0.4 | U |
| | | 56 | 2.4 | J | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 63.5 | 16 | | 7.6 | J | 1.7 | J | 0.95 | U | 0.44 | U |
| | | Average | 12 | | 24 | | 0.8 | | *** | | *** | |
| 211-A-015 | 9/6/2012 | 4.5 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 6 | 0.41 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 14 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 19 | 0.37 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 24 | 0.31 | U | 1.3 | U | 0.48 | U | 0.75 | U | 0.34 | U |
| | | 25.5 | 0.35 | U | 1.4 | U | 0.53 | U | 0.84 | U | 0.38 | U |
| | | 34 | 20 | | 30 | | 1 | J | 0.83 | U | 0.38 | U |
| | | 39 | 51 | | 83 | | 1.4 | J | 0.86 | U | 0.39 | U |
| | | 44.9 | 47 | | 22 | | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 46.5 | **120** | | 24 | | 0.71 | J | 0.84 | U | 0.39 | U |
| | | 50.1 | **130** | | 5.9 | J | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 59.9 | 57 | | 47 | | 1.9 | J | 0.91 | U | 0.42 | U |
| | | 63 | 36 | | 25 | | 3.3 | J | 1 | U | 0.46 | U |
| | | Average | 36 | | 19 | | 0.8 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-016 | 9/27/2012 | 0.1 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 6 | 1.7 | J | 1.7 | U | 1.1 | J | 0.97 | U | 0.45 | U |
| | | 14 | 0.48 | U | 2 | U | 0.74 | U | 1.2 | U | 0.53 | U |
| | | 16.5 | 2.1 | J | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 23.5 | 0.38 | U | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | (29.9)DUP | 34 | | 3.7 | J | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 29.9 | 33 | | 4.4 | J | 0.48 | U | 0.75 | U | 0.34 | U |
| | | 30.5 | **86** | | 18 | | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 35.1 | 6.4 | J | 4.8 | J | 0.64 | U | 1 | U | 0.46 | U |
| | | 43 | 26 | J | 26 | U | 11 | U | 8.7 | U | 29 | U |
| | | 46.5 | **300** | | 22 | U | 9.5 | U | 7.4 | U | 25 | U |
| | | 54 | **150** | | 8.6 | | 0.54 | J | 0.81 | U | 0.37 | U |
| | | 55.1 | **89** | J | 25 | U | 11 | U | 8.3 | U | 28 | U |
| | | 62.5 | **90** | | 110 | | 4.1 | J | 1.3 | U | 0.58 | U |
| | Average | | 58 | | 14 | | 1.7 | | *** | | *** | |
| 211-A-017 | 9/21/2012 | 1 | 0.48 | U | 2 | U | 0.74 | U | 1.2 | U | 0.53 | U |
| | | 9 | 2.4 | J | 1.9 | U | 6.4 | J | 1.1 | U | 0.5 | U |
| | | 14 | 2.2 | J | 1.6 | U | 21 | | 0.94 | U | 0.59 | J |
| | | 18 | **79** | | 1.4 | U | 9.5 | | 0.83 | U | 0.38 | U |
| | | (22.5)DUP | 31 | | 1.8 | U | 7.7 | J | 1.1 | U | 0.49 | U |
| | | 22.5 | 29 | | 1.4 | U | 7.2 | J | 0.84 | U | 0.38 | U |
| | | 29.5 | **1,500** | | 26 | U | 11 | U | 8.8 | U | 30 | U |
| | | 30.1 | **1,600** | | 22 | U | 9.6 | U | 7.5 | U | 25 | U |
| | | 39 | **190** | | 1.8 | U | 3 | J | 1.1 | U | 0.48 | U |
| | | 41.5 | 64 | | 1.5 | U | 0.86 | J | 0.87 | U | 0.4 | U |
| | | 49 | 9 | J | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 52.5 | 23 | | 1.5 | U | 0.71 | J | 0.85 | U | 0.39 | U |
| | | 59 | **180** | J | 29 | U | 12 | U | 9.7 | U | 33 | U |
| | | 61.5 | **150** | J | 23 | U | 10 | U | 7.9 | U | 27 | U |
| | Average | | **276** | | *** | | 5.6 | | *** | | 4.3 | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-018 | 9/11/2012 | 0.5 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 6.5 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | (11)DUP | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.45 | U |
| | | 11 | 0.36 | U | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 19.9 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 21 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 28.5 | 0.32 | U | 1.3 | U | 0.5 | U | 0.78 | U | 0.36 | U |
| | | 33 | 0.35 | U | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 36 | 1.1 | J | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 44.9 | 7.7 | J | 4.6 | J | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 48 | 49 | | 15 | | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 53.5 | **81** | | 23 | | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 56.5 | 66 | | 20 | | 0.62 | U | 0.97 | U | 0.44 | U |
| | 9/12/2012 | 62 | **440** | | 24 | U | 10 | U | 8.1 | U | 28 | U |
| | Average | | 46 | | 5.8 | | *** | | *** | | *** | |
| 211-A-019 | 9/12/2012 | 0.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 9 | 0.37 | U | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 14 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 19 | 0.32 | U | 1.3 | U | 0.49 | U | 0.77 | U | 0.35 | U |
| | | 23 | 0.34 | U | 1.4 | U | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 29.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 33.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 39 | 0.36 | U | 4.4 | J | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 44 | 0.35 | U | 2.4 | J | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 47 | 0.35 | U | 4.5 | J | 0.54 | U | 0.84 | U | 0.38 | U |
| | | 54 | 2 | J | 26 | | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 59 | 2.4 | J | 35 | | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 64 | 11 | | 59 | | 3 | J | 0.93 | U | 0.42 | U |
| | Average | | 1.3 | | 10 | | 0.5 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-020 | 9/24/2012 | 4.5 | 0.43 | U | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | | 9 | 9.9 | J | 1.7 | U | 1.8 | J | 1 | U | 0.46 | U |
| | | (9)DUP | 6.7 | J | 1.6 | U | 1.3 | J | 0.95 | U | 0.43 | U |
| | | 11 | 3.9 | J | 1.8 | U | 0.7 | J | 1 | U | 0.47 | U |
| | | 19 | 23 | | 1.5 | U | 5.4 | J | 0.88 | U | 0.4 | U |
| | | 20.1 | 12 | | 1.9 | U | 3.3 | J | 1.1 | U | 0.51 | U |
| | | 25.9 | **710** | | 24 | U | 10 | U | 8 | U | 27 | U |
| | | 32 | **210** | | 1.9 | U | 4.3 | J | 1.1 | U | 0.49 | U |
| | | 35.5 | **470** | | 25 | U | 11 | U | 8.3 | U | 28 | U |
| | | 40.1 | **770** | | 23 | U | 9.8 | U | 7.7 | U | 26 | U |
| | | 48 | **800** | | 23 | U | 9.8 | U | 7.6 | U | 26 | U |
| | | 53.5 | **300** | | 22 | U | 9.4 | U | 7.3 | U | 25 | U |
| | | 57 | **800** | | 25 | U | 11 | U | 8.5 | U | 29 | U |
| | | 62 | **180** | | 6.7 | J | 3.1 | J | 0.95 | U | 0.44 | U |
| | | 65.1 | **160** | | 17 | | 4.3 | J | 1.1 | U | 0.5 | U |
| | | Average | **297** | | 6.7 | | 3.7 | | *** | | *** | |
| 211-A-021 | 9/6/2012 | 0.1 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 6.5 | 0.4 | U | 1.7 | U | 0.74 | J | 0.97 | U | 0.44 | U |
| | | 14 | 0.38 | U | 1.6 | U | 1.2 | J | 0.92 | U | 0.42 | U |
| | | 18.5 | 0.34 | U | 1.4 | U | 0.54 | J | 0.81 | U | 0.37 | U |
| | | 24 | 0.33 | U | 1.4 | U | 0.51 | U | 0.79 | U | 0.36 | U |
| | | 29.5 | 15 | | 22 | | 1.6 | J | 0.91 | U | 0.42 | U |
| | | 30.5 | 7.7 | J | 7.5 | J | 0.73 | J | 0.78 | U | 0.36 | U |
| | | 39 | 46 | | 84 | | 3.6 | J | 0.89 | U | 0.41 | U |
| | | (44)DUP | 59 | | 110 | | 3.8 | J | 0.87 | U | 0.47 | J |
| | | 44 | 50 | | 95 | | 3.5 | J | 0.9 | U | 0.41 | U |
| | | 49 | 46 | | 82 | | 3.1 | J | 0.81 | U | 0.37 | U |
| | | 54 | 30 | | 29 | | 3.3 | J | 0.86 | U | 0.39 | U |
| | | 55.1 | 7.5 | J | 6.2 | J | 1.2 | J | 0.93 | U | 0.43 | U |
| | | 64 | 6.2 | J | 3.4 | J | 0.82 | J | 0.99 | U | 0.45 | U |
| | | Average | 19 | | 32 | | 1.8 | | *** | | 0.2 | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 75 | | 137 | | 619 | | 5290 | | 570 | |
| 211-A-022 | 9/27/2012 | 0.5 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 6 | 2.7 | J | 1.7 | U | 0.7 | J | 0.97 | U | 0.44 | U |
| | | 14 | 3.2 | J | 1.6 | U | 0.69 | J | 0.94 | U | 0.43 | U |
| | | 18.5 | 1.6 | J | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 24.9 | 0.37 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 27.5 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 33.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 35.1 | 8.5 | J | 6.7 | J | 0.85 | J | 0.83 | U | 0.38 | U |
| | | 44 | 10 | | 12 | | 1 | J | 0.86 | U | 0.39 | U |
| | | 49.5 | 6.7 | J | 5 | J | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 54.5 | 13 | | 17 | | 0.79 | J | 1.1 | U | 0.52 | U |
| | | 56 | **88** | | 1.8 | J | 1 | J | 0.89 | U | 0.41 | U |
| | | 62 | 27 | | 5.3 | J | 1.2 | J | 1 | U | 0.46 | U |
| | Average | | 12 | | 4.1 | | 0.6 | | *** | | *** | |
| 211-A-023 | 9/11/2012 | 1 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 7 | 0.37 | U | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 14.9 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 18 | 0.36 | U | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 20.1 | 0.33 | U | 1.6 | J | 0.51 | U | 0.81 | U | 0.37 | U |
| | | (20.1)DUP | 0.36 | U | 7.2 | J | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 25.5 | 0.33 | U | 3.9 | J | 0.5 | U | 0.78 | U | 0.36 | U |
| | | 34.9 | 0.37 | U | 1.5 | U | 0.57 | U | 0.89 | U | 0.4 | U |
| | | 36.5 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 43 | 0.39 | U | 7.9 | J | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 49 | 1.4 | J | 9.9 | | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 53 | 66 | | 8.6 | J | 0.87 | J | 0.97 | U | 0.45 | U |
| | | 55.1 | **130** | | 6.9 | J | 1.5 | J | 0.94 | U | 0.43 | U |
| | | 62 | 73 | | 11 | | 1 | J | 1 | U | 0.46 | U |
| | Average | | 19 | | 4.4 | | 0.5 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-024 | 9/10/2012 | 1 | 0.37 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 9 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 14 | 0.4 | U | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 19 | 2.2 | J | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 24 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 26 | 1.8 | J | 1.2 | U | 0.46 | U | 0.71 | U | 0.33 | U |
| | | 33 | 0.36 | U | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 39 | 0.86 | J | 1.8 | U | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 44 | 1.3 | J | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 49 | 3.4 | J | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 52.5 | **76** | | 1.5 | U | 0.73 | J | 0.86 | U | 0.39 | U |
| | | 56 | 9.2 | J | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 64.5 | 25 | | 1.8 | U | 0.91 | J | 1.1 | U | 0.49 | U |
| | Average | | 9 | | *** | | 0.4 | | *** | | *** | |
| 211-A-025 | 9/10/2012 | 3 | 71 | | 1.7 | U | 13 | | 0.97 | U | 0.45 | U |
| | | 6.5 | **92** | | 2.1 | U | 28 | | 1.2 | U | 0.55 | U |
| | | 11 | **80** | | 1.6 | U | 23 | | 0.94 | U | 0.43 | U |
| | | (15.5)DUP | 33 | | 1.7 | U | 9 | J | 0.97 | U | 0.44 | U |
| | | 15.5 | **80** | | 1.8 | U | 20 | | 1.1 | U | 0.48 | U |
| | | 22.5 | 54 | | 1.5 | U | 14 | | 0.88 | U | 0.4 | U |
| | | 25.5 | 45 | | 1.4 | U | 1.2 | J | 0.82 | U | 0.38 | U |
| | | 32.5 | 63 | | 1.6 | U | 1.4 | J | 0.95 | U | 0.44 | U |
| | | 39.5 | **420** | | 23 | U | 10 | U | 7.9 | U | 27 | U |
| | | 44.5 | **1,400** | | 23 | U | 44 | J | 7.7 | U | 26 | U |
| | | 49.9 | **540** | | 27 | U | 24 | J | 9.1 | U | 31 | U |
| | | 50.1 | 27 | | 1.5 | U | 0.9 | J | 0.88 | U | 0.4 | U |
| | | 56.5 | 7 | J | 1.9 | U | 0.72 | U | 1.1 | U | 0.52 | U |
| | | 64 | 68 | | 1.7 | U | 0.65 | U | 1 | U | 0.47 | U |
| | Average | | **213** | | *** | | 13 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-026 | 9/7/2012 | 4 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 9 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 14 | 0.41 | U | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 18.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 24.9 | 0.35 | U | 1.5 | U | 0.55 | U | 0.85 | U | 0.39 | U |
| | | 29 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.4 | U |
| | | 30.5 | 0.41 | J | 1.4 | U | 0.51 | U | 0.8 | U | 0.37 | U |
| | | 36 | 12 | | 15 | | 2.3 | J | 0.99 | U | 0.45 | U |
| | | 44 | 12 | | 14 | | 4.1 | J | 0.88 | U | 0.84 | J |
| | | 47 | 14 | | 20 | | 3.9 | J | 0.88 | U | 1 | J |
| | | 51 | 7.2 | J | 6.6 | J | 2.2 | J | 0.96 | U | 0.44 | U |
| | | 55.5 | 14 | | 1.6 | U | 0.65 | J | 0.92 | U | 0.42 | U |
| | | 61.5 | 1.2 | J | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | Average | | 4.8 | | 4.8 | | 1.2 | | *** | | 0.3 | |
| 211-A-027 | 9/11/2012 | 2 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 8.5 | 0.53 | U | 2.2 | U | 0.81 | U | 1.3 | U | 0.58 | U |
| | 9/18/2012 | 14 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | (14)DUP | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 16.5 | 0.35 | U | 1.5 | U | 0.55 | U | 0.85 | U | 0.39 | U |
| | | 21 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 28 | 0.35 | U | 1.4 | U | 0.54 | U | 0.84 | U | 0.39 | U |
| | | 31.5 | 0.46 | J | 1.7 | J | 0.51 | U | 0.8 | U | 0.36 | U |
| | | 36.5 | 3.4 | J | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 44.5 | 47 | | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 45.5 | **620** | | 20 | U | 8.7 | U | 6.8 | U | 23 | U |
| | | 51 | 51 | | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 59 | 29 | | 1.7 | U | 0.67 | J | 1 | U | 0.46 | U |
| | | 66.5 | 17 | | 1.9 | J | 0.86 | J | 1.1 | U | 0.48 | U |
| | Average | | 55 | | 1.6 | | 0.7 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-028 | 9/24/2012 | 4 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 9 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.48 | U |
| | | 14 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 19 | 0.76 | J | 55 | | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 22.5 | 0.44 | U | 1.8 | J | 0.67 | U | 1.1 | U | 0.48 | U |
| | | 26 | **210** | | **290** | | 0.92 | U | 1.4 | U | 0.66 | U |
| | | 34 | **220** | J | 55 | J | 11 | U | 8.9 | U | 30 | U |
| | | 38.5 | **3,700** | | **4,200** | | 33 | J | 9.1 | U | 31 | U |
| | | 42.5 | **2,800** | | **3,800** | | 28 | J | 7.8 | U | 27 | U |
| | | 48 | **1,600** | | **1,800** | | 33 | J | 8.1 | U | 27 | U |
| | | 50.5 | **1,700** | | **1,400** | | 38 | J | 8.3 | U | 28 | U |
| | | 55.1 | 42 | | 79 | | 4.2 | J | 0.95 | U | 0.43 | U |
| | | 61 | **180** | | 66 | | 16 | | 1.3 | U | 0.58 | U |
| | Average | | **804** | | **904** | | 12 | | *** | | *** | |
| 211-A-029 | 9/25/2012 | 4 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 9 | 0.51 | U | 2.1 | U | 0.79 | U | 1.2 | U | 0.56 | U |
| | | 14 | 0.4 | U | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 18 | 0.31 | U | 1.3 | U | 0.48 | U | 0.74 | U | 0.34 | U |
| | | 24.9 | 23 | | 18 | | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 28.5 | **440** | | **240** | | 9 | U | 7 | U | 24 | U |
| | | (32)DUP | **110** | | 77 | | 2.5 | J | 1.4 | U | 0.65 | U |
| | | 32 | **480** | | **360** | | 12 | U | 9.4 | U | 32 | U |
| | | 38 | **2,600** | | **2,900** | | 62 | J | 9.2 | U | 31 | U |
| | | 40.5 | **870** | | **880** | | 11 | U | 8.2 | U | 28 | U |
| | | 48.5 | **270** | | **350** | | 11 | U | 8.6 | U | 29 | U |
| | | 50.5 | 22 | | 27 | | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 55.1 | 4 | J | 4.4 | J | 0.86 | J | 1 | U | 0.46 | U |
| | | 64 | **100** | | 15 | | 9.2 | J | 1.1 | U | 0.49 | U |
| | Average | | **351** | | **348** | | 7.0 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-030 | 9/25/2012 | 9 | 0.39 | U | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 14 | 0.36 | U | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 19 | 0.36 | U | 30 | | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 23.5 | 21 | U | 29 | U | 13 | U | 9.9 | U | 34 | U |
| | | 29.9 | 0.51 | U | 2.1 | U | 0.78 | U | 1.2 | U | 0.56 | U |
| | | 32.5 | **97** | J | 61 | J | 11 | U | 8.9 | U | 30 | U |
| | | 39 | 0.38 | U | 3.5 | J | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 40.1 | 0.38 | U | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 49 | 0.39 | U | 8.9 | J | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 54.5 | 4.8 | J | 2 | J | 0.76 | J | 0.91 | U | 0.41 | U |
| | | 58 | 20 | | 25 | | 1.9 | J | 1 | U | 0.47 | U |
| | | 61 | 12 | | 15 | | 1.5 | J | 0.93 | U | 0.42 | U |
| | Average | | 12 | | 14 | | 1.5 | | *** | | *** | |
| 211-A-031 | 9/26/2012 | 0.1 | 0.46 | U | 1.9 | U | 0.71 | U | 1.1 | U | 0.51 | U |
| | | 9 | 0.41 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | (14)DUP | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 14 | 0.35 | U | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 19 | 2.9 | J | 1.5 | U | 0.9 | J | 0.85 | U | 0.39 | U |
| | | 23 | 1 | J | 1.6 | U | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 28 | 7.8 | J | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 34.5 | 35 | | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 35.5 | **310** | | 22 | U | 9.5 | U | 7.4 | U | 25 | U |
| | | 40.5 | 18 | U | 24 | U | 10 | U | 8.1 | U | 28 | U |
| | | 49.5 | 42 | | 1.6 | U | 0.64 | J | 0.93 | U | 0.43 | U |
| | | 50.5 | 29 | | 1.8 | U | 0.69 | U | 1.1 | U | 0.49 | U |
| | | 56.5 | 5.8 | J | 1.6 | U | 0.62 | J | 0.96 | U | 0.44 | U |
| | | 61.5 | 3.5 | J | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | Average | | 32 | | *** | | 1.1 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-032 | 9/28/2012 | 1.3 | 0.38 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 9 | 0.41 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 14 | 0.37 | U | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 19 | 1.1 | J | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 24.9 | 4.7 | J | 1.8 | U | 2 | J | 1.1 | U | 0.49 | U |
| | | 26 | 6.6 | J | 1.5 | U | 1.7 | J | 0.9 | U | 0.41 | U |
| | | 33 | 0.47 | J | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 38 | 33 | | 1.8 | U | 0.68 | U | 1.1 | U | 0.48 | U |
| | | 42.5 | 29 | | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 49 | 3.3 | J | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 54.9 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 58.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | Average | | 6.6 | | *** | | 0.6 | | *** | | *** | |
| 211-A-033 | 10/1/2012 | 4 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 9 | 0.38 | U | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 14 | 0.37 | U | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 19 | 0.35 | U | 1.5 | U | 0.55 | U | 0.85 | U | 0.39 | U |
| | | 21.5 | 0.33 | U | 1.4 | U | 0.51 | U | 0.8 | U | 0.37 | U |
| | | 29.9 | 3.6 | J | 2.4 | J | 0.64 | U | 1 | U | 0.46 | U |
| | | (34)DUP | 12 | | 1.9 | J | 0.84 | J | 0.8 | U | 0.36 | U |
| | | 34 | 60 | | 16 | | 2.1 | J | 0.84 | U | 0.38 | U |
| | | 36 | **1,100** | | **1,100** | | 46 | J | 8 | U | 27 | U |
| | | 44.5 | **700** | | **540** | | 29 | J | 7.4 | U | 25 | U |
| | | 49.5 | **300** | | **240** | | 9.3 | U | 7.3 | U | 25 | U |
| | | 50.5 | **130** | J | 58 | J | 12 | U | 9.7 | U | 33 | U |
| | | 56.5 | 0.48 | J | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 62 | 14 | | 3.6 | J | 8.4 | J | 0.89 | U | 0.41 | U |
| | Average | | **166** | | **140** | | 7.1 | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-035 | 10/2/2012 | 1.9 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 8.6 | 0.39 | U | 1.6 | U | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 13.4 | 0.38 | U | 2.5 | J | 3.6 | J | 0.9 | U | 0.41 | U |
| | | 18.5 | 1.6 | J | 33 | | 12 | | 0.87 | U | 0.4 | U |
| | | 24 | 7.6 | J | 30 | | 6.9 | J | 0.89 | U | 0.41 | U |
| | | 27 | 2.1 | J | 1.7 | J | 0.53 | U | 0.84 | U | 0.38 | U |
| | | 30.5 | 35 | | 27 | | 0.57 | U | 0.89 | U | 0.4 | U |
| | | 37 | **580** | | **590** | | 11 | U | 8.3 | U | 28 | U |
| | | (41.5)DUP | **420** | | **350** | | 11 | U | 8.2 | U | 28 | U |
| | | 41.5 | **400** | | **400** | | 10 | U | 8 | U | 27 | U |
| | | 49 | **210** | J | 26 | J | 11 | U | 8.4 | U | 29 | U |
| | | 51.5 | **680** | | **360** | | 10 | U | 8.2 | U | 28 | U |
| | | 55.5 | 17 | | 1.7 | U | 2 | J | 1 | U | 0.46 | U |
| | | 66.5 | 25 | | 9.3 | J | 4 | J | 0.98 | U | 0.45 | U |
| | Average | | **170** | | 131 | | 4 | | *** | | *** | |
| 211-A-036 | 10/3/2012 | 0.1 | 0.41 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 9 | 0.47 | U | 1.9 | U | 0.73 | U | 1.1 | U | 0.52 | U |
| | | 14.7 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 19 | 0.67 | J | 2.1 | J | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 22 | **280** | J | 31 | U | 13 | U | 10 | U | 35 | U |
| | | 26.5 | **810** | | **340** | | 9.9 | U | 7.8 | U | 26 | U |
| | | 31.5 | **1,400** | | **1,600** | | 8.6 | U | 6.7 | U | 23 | U |
| | | 35.5 | **2,800** | | **3,700** | | 51 | J | 8.2 | U | 28 | U |
| | | 44.5 | **3,800** | | **3,900** | | 110 | J | 7.6 | U | 28 | J |
| | | 47.5 | **4,800** | | **3,300** | | 77 | J | 8 | U | 27 | U |
| | | 50.1 | **1,300** | | **690** | | 12 | U | 9.1 | U | 31 | U |
| | | 55.5 | 3 | J | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 61 | 33 | | 12 | | 4.1 | J | 0.99 | U | 0.45 | U |
| | Average | | **1,171** | | **1,043** | | 20 | | *** | | 9 | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | 1,1-DCE [µg/kg] | *cis*-1,2-DCE [µg/kg] | *trans*-1,2-DCE [µg/kg] | VC [µg/kg] |
|---|---|---|---|---|---|---|---|
| | | | **75** | **137** | **619** | **5290** | **570** |
| 211-A-037 | 2/25/2013 | 4 | 0.4 U | 1.6 U | 0.61 U | 0.96 U | 0.44 U |
| | | 9 | 0.39 U | 1.6 U | 0.61 U | 0.95 U | 0.43 U |
| | | 14 | 0.42 U | 1.7 U | 0.65 U | 1 U | 0.47 U |
| | | 16 | 0.38 U | 1.6 U | 0.58 U | 0.91 U | 0.41 U |
| | | 24 | 0.47 U | 1.9 U | 0.72 U | 1.1 U | 0.51 U |
| | | (24)Dup | 0.53 U | 2.2 U | 0.81 U | 1.3 U | 0.58 U |
| | | 25.5 | 0.36 U | 1.5 U | 0.55 U | 0.87 U | 0.4 U |
| | | 34 | 0.51 U | 2.1 U | 0.78 U | 1.2 U | 0.56 U |
| | | 35.5 | 0.54 U | 2.2 U | 0.84 U | 1.3 U | 0.6 U |
| | | 44 | 0.37 U | 2.3 J | 0.57 U | 0.89 U | 0.41 U |
| | | 49.5 | 0.37 U | 1.5 U | 0.57 U | 0.89 U | 0.41 U |
| | | 54.5 | 2.2 J | 1.7 U | 0.65 U | 1 U | 0.47 U |
| | | 56.5 | 1.4 J | 2.5 U | 0.93 U | 1.5 U | 0.67 U |
| | | 62 | 1.2 J | 1.8 U | 0.67 U | 1 U | 0.48 U |
| | Average | | 0.5 | *** | *** | *** | *** |
| 211-A-038 | 2/25/2013 | 3 | 0.37 U | 1.5 U | 0.58 U | 0.9 U | 0.41 U |
| | | 7.5 | 20 U | 27 U | 12 U | 9.2 U | 31 U |
| | | 12 | 23 U | 32 U | 14 U | 11 U | 36 U |
| | | 15.5 | 0.41 U | 1.7 U | 0.64 U | 1 U | 0.46 U |
| | | 20.5 | 26 | 1.6 U | 6.8 J | 0.96 U | 2.2 J |
| | | 28.5 | 0.36 U | 1.5 U | 0.55 U | 0.86 U | 0.39 U |
| | | 32.5 | 0.37 U | 1.5 U | 0.57 U | 0.89 U | 0.41 U |
| | | 39 | 30 | 1.6 U | 7.5 J | 0.92 U | 0.42 U |
| | | 43 | 61 | 2 J | 10 | 0.91 U | 0.42 U |
| | | 49.9 | 0.98 J | 1.6 U | 0.6 U | 0.93 U | 0.43 U |
| | | 54.5 | 6.6 J | 1.5 U | 1.2 J | 0.89 U | 0.4 U |
| | | 56 | 20 | 3.6 J | 6.6 J | 0.97 U | 0.44 U |
| | | 62 | 11 | 1.8 J | 4 J | 0.89 U | 0.41 U |
| | Average | | 14 | 3.3 | 3.9 | *** | 2.9 |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 75 | | 137 | | 619 | | 5290 | | 570 | |
| 211-A-039 | 2/26/2013 | 9 | 0.41 | U | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 14 | 0.44 | U | 1.8 | U | 0.67 | U | 1.1 | U | 0.48 | U |
| | | (14)Dup | 0.46 | U | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 19 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.4 | U |
| | | 23 | 0.39 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.43 | U |
| | | 27.5 | 0.44 | U | 1.8 | U | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 33 | 0.34 | U | 1.4 | U | 0.55 | J | 0.83 | U | 0.38 | U |
| | | 37 | 0.41 | U | 3.4 | J | 1.5 | J | 1 | U | 0.46 | U |
| | | 42 | 0.38 | U | 15 | | 1.8 | J | 0.92 | U | 0.42 | U |
| | | 49.5 | 0.34 | U | 12 | | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 51.5 | 0.39 | U | 57 | | 0.66 | J | 0.93 | U | 0.43 | U |
| | | 56 | 1 | J | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 64 | 4.5 | J | 2.3 | U | 0.86 | U | 1.3 | U | 0.61 | U |
| | Average | | 0.6 | | 7.3 | | 0.57 | | *** | | *** | |
| 211-A-040 | 2/26/2013 | 3 | 0.4 | U | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 9 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 14 | 0.38 | U | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 16.5 | 0.42 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 22 | 0.53 | U | 2.2 | U | 0.82 | U | 1.3 | U | 0.59 | U |
| | | 26 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 34.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 36 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | (36)Dup | 0.35 | U | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 41.5 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 48.5 | 0.37 | U | 2.4 | J | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 51.5 | 0.37 | U | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 56 | 0.36 | U | 21 | | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 61 | 0.38 | U | 3.2 | J | 0.58 | U | 0.91 | U | 0.42 | U |
| | Average | | *** | | 2.5 | | *** | | *** | | *** | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **75** | | **137** | | **619** | | **5290** | | **570** | |
| 211-A-041 | 2/27/2013 | 4 | 0.39 | U | 1.6 | U | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 9 | 0.41 | U | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 14.5 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 18.5 | 0.37 | U | 8.8 | J | 0.57 | U | 0.89 | U | 0.41 | U |
| | | (18.5)Dup | 0.35 | U | 8.7 | J | 0.54 | U | 0.84 | U | 0.39 | U |
| | | 24 | 0.53 | U | 2.2 | U | 0.82 | U | 1.3 | U | 0.59 | U |
| | | 27 | 0.34 | U | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 34.5 | 1.7 | J | 1.6 | J | 2.2 | J | 0.86 | U | 1.1 | J |
| | | 39 | 71 | | 120 | | 14 | | 1 | U | 6.5 | J |
| | | 41 | **76** | | **140** | | 11 | | 0.86 | U | 6.4 | J |
| | | 49 | 33 | | **170** | | 8.5 | J | 0.84 | U | 0.72 | J |
| | | 50.5 | 18 | | 26 | | 4.1 | J | 0.98 | U | 0.45 | U |
| | | 55.1 | 27 | | 2.2 | J | 2.8 | J | 1 | U | 0.46 | U |
| | | 63 | 68 | | 21 | | 15 | | 0.87 | U | 0.4 | U |
| | Average | | 21 | | 36 | | 4.3 | | *** | | 1.2 | |
| 211-A-042 | 2/27/2013 | 9 | 0.41 | U | 1.7 | U | 2.8 | J | 0.99 | U | 0.45 | U |
| | | 14.5 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 17 | 0.37 | U | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 22.5 | 0.33 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 27.5 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 31 | 0.38 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 39 | 61 | | 68 | | 9.6 | J | 0.95 | U | 2 | J |
| | | 42 | **120** | | 94 | | 16 | | 0.98 | U | 2.4 | J |
| | | 48 | **82** | | 40 | | 9 | J | 0.92 | U | 0.6 | J |
| | | 54.9 | 40 | | 21 | | 5.7 | J | 0.88 | U | 0.4 | U |
| | | 57 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.41 | U |
| | | 62.5 | 27 | | 6.4 | J | 5.2 | J | 0.98 | U | 0.45 | U |
| | Average | | 28 | | 20 | | 4.2 | | *** | | 0.6 | |

**SWMU 211-A VOC Analyes (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | 1,1-DCE [µg/kg] | *cis*-1,2-DCE [µg/kg] | *trans*-1,2-DCE [µg/kg] | VC [µg/kg] |
|---|---|---|---|---|---|---|---|
| | | | **75** | **137** | **619** | **5290** | **570** |
| 211-A-043 | 3/4/2013 | 3.5 | 0.34 U | 1.4 U | 0.52 U | 0.81 U | 0.37 U |
| | | 9 | 0.42 U | 1.7 U | 0.97 J | 1 U | 0.46 U |
| | | 14 | 0.39 U | 1.6 U | 0.6 U | 0.93 U | 0.43 U |
| | | (14)Dup | 0.4 U | 1.6 U | 0.61 U | 0.96 U | 0.44 U |
| | | 17.5 | 0.35 U | 1.4 U | 0.54 U | 0.84 U | 0.38 U |
| | | 22.5 | 0.32 U | 1.3 U | 1.2 J | 0.78 U | 0.36 U |
| | | 29 | 2.7 J | 1.7 U | 8.3 J | 0.98 U | 0.45 U |
| | | 32.5 | 1.8 J | 1.5 U | 5.2 J | 0.9 U | 0.41 U |
| | | 36 | 9.2 | 2 J | 28 | 0.86 U | 0.39 U |
| | | 44.9 | 24 | 13 | 32 | 0.94 U | 0.43 U |
| | | 49 | 39 | 6.7 J | 34 | 0.81 U | 0.37 U |
| | | 53.5 | 30 | 1.7 U | 46 | 0.97 U | 0.44 U |
| | | 55.1 | 42 | 5.1 J | 48 | 0.84 U | 0.39 U |
| | | 62 | 0.39 U | 1.6 U | 0.6 U | 0.94 U | 0.43 U |
| | Average | | 11 | 2.5 | 15 | *** | *** |
| 211-A-044 | 3/6/2013 | 4 | 5.5 J | 1.7 U | 100 | 1 U | 78 |
| | | (4)Dup | 4.2 J | 1.7 U | 49 | 1 U | 62 |
| | | 6 | 20 U | 28 U | **630** | 9.4 U | 32 U |
| | | 10.5 | 18 U | 25 U | 520 | 8.5 U | 29 U |
| | | 18.5 | 0.46 U | 1.9 U | 1.2 J | 1.1 U | 0.5 U |
| | | 23 | 5 J | 1.3 U | 31 | 0.76 U | 0.96 J |
| | | 26 | 11 | 1.9 U | 99 | 1.1 U | 9.2 J |
| | | 33.5 | 8.5 J | 1.7 U | 64 | 1 U | 3.2 J |
| | | 36.5 | 18 | 1.8 J | 98 | 0.82 U | 4.8 J |
| | | 44.5 | 42 | 2.6 J | 130 | 0.88 U | 9.9 |
| | | 49 | **76** | 9.6 | 110 | 0.85 U | 0.77 J |
| | | 54.5 | 2.7 J | 1.5 U | 4.8 J | 0.86 U | 0.39 U |
| | | 55.5 | 2.5 J | 1.9 U | 1.7 J | 1.1 U | 0.52 U |
| | | 62.5 | 0.47 U | 1.9 U | 0.72 U | 1.1 U | 0.51 U |
| | Average | | 14 | 3.4 | 131 | *** | 14 |

## SWMU 211-A VOC Analyes (Continued)

Notes:

1. Groundwater Protection Remediation Goals from *Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (DOE 2012a).
2. J—Indicates an estimated value.
3. U—Compound analyzed for but not detected at or below the lowest concentration reported.
4. DUP—Indicated that a duplicate sample was taken for the interval given in parentheses.
5. Sample depth represents the discrete depth at which an EnCore® sample was taken.
6. For "U" qualified samples a value of one half the concentration reported was used in calculating the average borehole concentration.
7. ***—Indicates average concentration not calculated as all boring samples were "U" qualified for specific VOC.
8. Yellow shading and bold text indicate an exceedance of Groundwater Protection Remediation Goals.
9. Soil boring 211-A-007 was not collected.
10. Soil boring 211-A-034 was collected and archived. Boring was not logged or screened for VOC impacts.

# APPENDIX F

# HYDRAULIC CONDUCTIVITY AND GRAIN SIZE TESTS

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Grain Size Analysis

ASTM D422

Advanced Terra Testing

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-05

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-006 | SAMPLED | 09/26/12 KD |
| DEPTH | 12-15.5' | DATE TESTED | 10/10/12 JS |
| SAMPLE NO. | 211A006GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 40.14 |
| Wt. Dry Soil & Pan (g) | | 39.59 |
| Wt. Lost Moisture (g) | | 0.55 |
| Wt. of Pan Only (g) | | 3.07 |
| Wt. of Dry Soil (g) | | 36.52 |
| Moisture Content % | | 1.5 |
| Wt. Hydrom. Sample Wet (g) | | 62.50 |
| Wt. Hydrom. Sample Dry (g) | | 61.57 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1120.50 |
| Weight of + #10 Before Washing (g) | 0.92 |
| Weight of + #10 After Washing (g) | 0.87 |
| Weight of - #10 Wet (g) | 1119.58 |
| Weight of - #10 Dry (g) | 1103.02 |
| Wt. Total Sample Dry (g) | 1103.89 |
| Calc. Wt. "W" (g) | 61.62 |
| Calc. Mass + #10 | 0.05 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 0.71 | 0.71 | 0.71 | 0.1 | 99.9 |
| #10 | 0.00 | 0.16 | 0.16 | 0.87 | 0.1 | 99.9 |
| #20 | 3.03 | 3.06 | 0.03 | 0.03 | 0.1 | 99.9 |
| #40 | 3.11 | 3.19 | 0.08 | 0.10 | 0.2 | 99.8 |
| #60 | 3.07 | 3.42 | 0.35 | 0.45 | 0.8 | 99.2 |
| #100 | 3.01 | 4.84 | 1.83 | 2.28 | 3.8 | 96.2 |
| #200 | 3.01 | 4.94 | 1.93 | 4.21 | 6.9 | 93.1 |

Data entered by: DAW Date: 10/12/2012
Data checked by: Date: 10/12/12
FileName: LKH0NSZ1

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-05 |
| BORING NO. | 211-A-006 | SAMPLED | 09/26/12 KD |
| DEPTH | 12-15.5' | DATE TESTED | 10/10/12 JS |
| SAMPLE NO. | 211A006GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

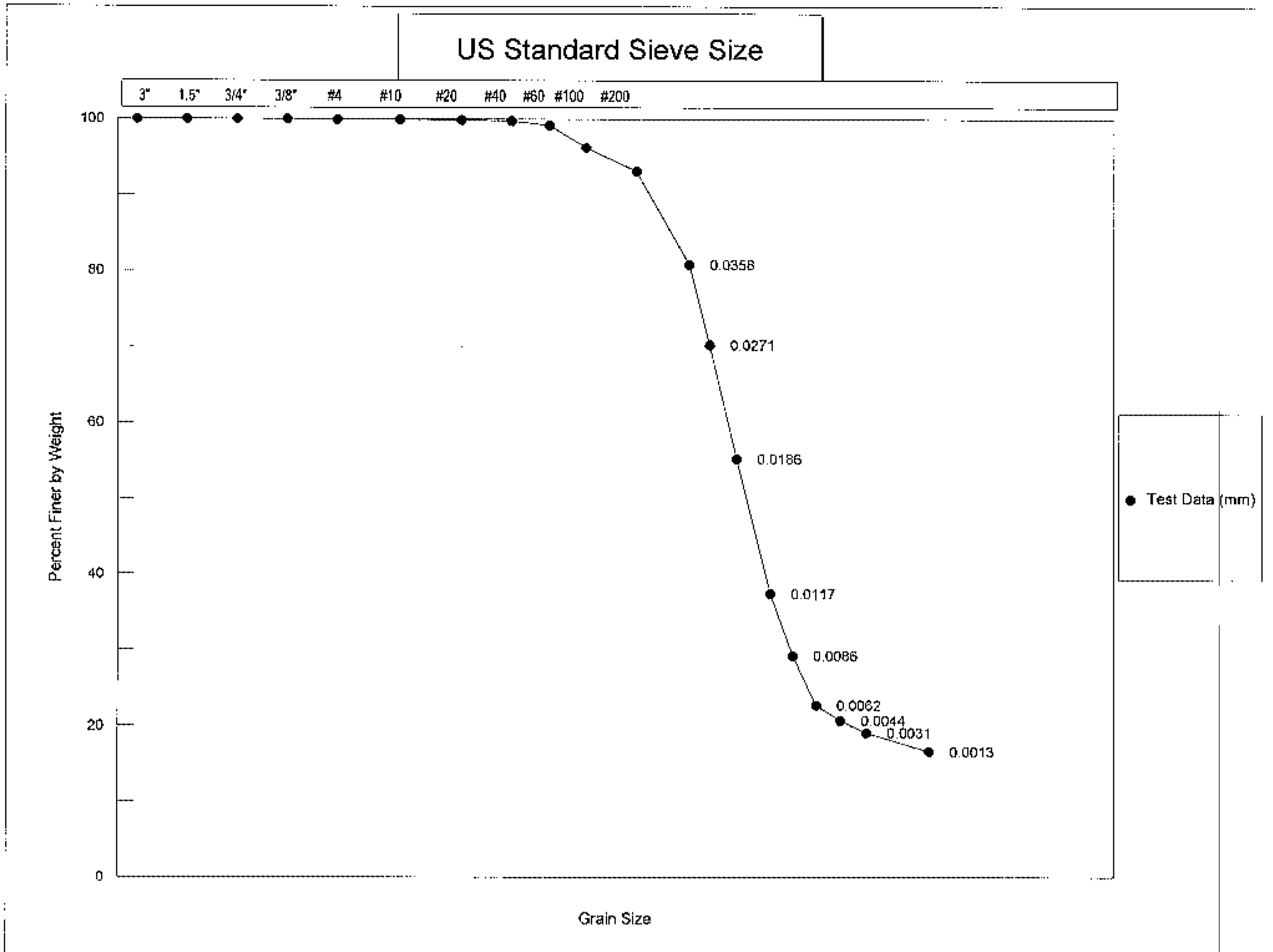
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.5 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01325 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 61.622 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 54.75 | 49.75 | 80.7 | 80.7 | 7.31 | 0.0358 |
| 2.0 | 48.25 | 43.25 | 70.2 | 70.2 | 8.38 | 0.0271 |
| 5.0 | 39.00 | 34.00 | 55.2 | 55.2 | 9.89 | 0.0186 |
| 15.0 | 28.00 | 23.00 | 37.3 | 37.3 | 11.70 | 0.0117 |
| 30.0 | 23.00 | 18.00 | 29.2 | 29.2 | 12.52 | 0.0086 |
| 60.0 | 19.00 | 14.00 | 22.7 | 22.7 | 13.17 | 0.0062 |
| 120.0 | 17.75 | 12.75 | 20.7 | 20.7 | 13.38 | 0.0044 |
| 250.0 | 16.75 | 11.75 | 19.1 | 19.1 | 13.54 | 0.0031 |
| 1440.0 | 15.25 | 10.25 | 16.6 | 16.6 | 13.79 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/12/2012
Data checked by: Date: 10/12/12
FileName: LKH0NSZ1

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-A-006 Sample No.: 211A006GRNSZ1

Job Number: 2855-05 Depth: 12-15.5'

Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-05 |
| BORING NO. | 211-A-006 | SAMPLED | 09/26/12 KD |
| DEPTH | | DATE TESTED | 10/10/12 JS |
| SAMPLE NO. | 211A006GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 34.10 |
| Wt. Dry Soil & Pan (g) | 33.65 |
| Wt. Lost Moisture (g) | 0.45 |
| Wt. of Pan Only (g) | 2.42 |
| Wt. of Dry Soil (g) | 31.23 |
| Moisture Content % | 1.4 |
| Wt. Hydrom. Sample Wet (g) | 86.50 |
| Wt. Hydrom. Sample Dry (g) | 85.27 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 929.90 |
| Weight of + #10 Before Washing (g) | 494.76 |
| Weight of + #10 After Washing (g) | 470.13 |
| Weight of - #10 Wet (g) | 435.14 |
| Weight of - #10 Dry (g) | 453.24 |
| Wt. Total Sample Dry (g) | 923.37 |
| Calc. Wt. "W" (g) | 173.72 |
| Calc. Mass + #10 | 88.45 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 42.14 | 42.14 | 42.14 | 4.6 | 95.4 |
| 3/8" | 0.00 | 102.72 | 102.72 | 144.86 | 15.7 | 84.3 |
| #4 | 0.00 | 174.75 | 174.75 | 319.61 | 34.6 | 65.4 |
| #10 | 0.00 | 150.52 | 150.52 | 470.13 | 50.9 | 49.1 |
| #20 | 3.05 | 18.15 | 15.10 | 15.10 | 59.6 | 40.4 |
| #40 | 3.06 | 17.47 | 14.41 | 29.51 | 67.9 | 32.1 |
| #60 | 3.05 | 15.15 | 12.10 | 41.62 | 74.9 | 25.1 |
| #100 | 2.98 | 9.72 | 6.74 | 48.36 | 78.7 | 21.3 |
| #200 | 3.08 | 6.90 | 3.82 | 52.17 | 80.9 | 19.1 |

Data entered by: DAW Date: 10/12/2012
Data checked by: Date: 10/12/12
FileName: LKH0NSZ2

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-05 |
| BORING NO. | 211-A-006 | SAMPLED | 09/26/12 KD |
| DEPTH | | DATE TESTED | 10/10/12 JS |
| SAMPLE NO. | 211A006GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

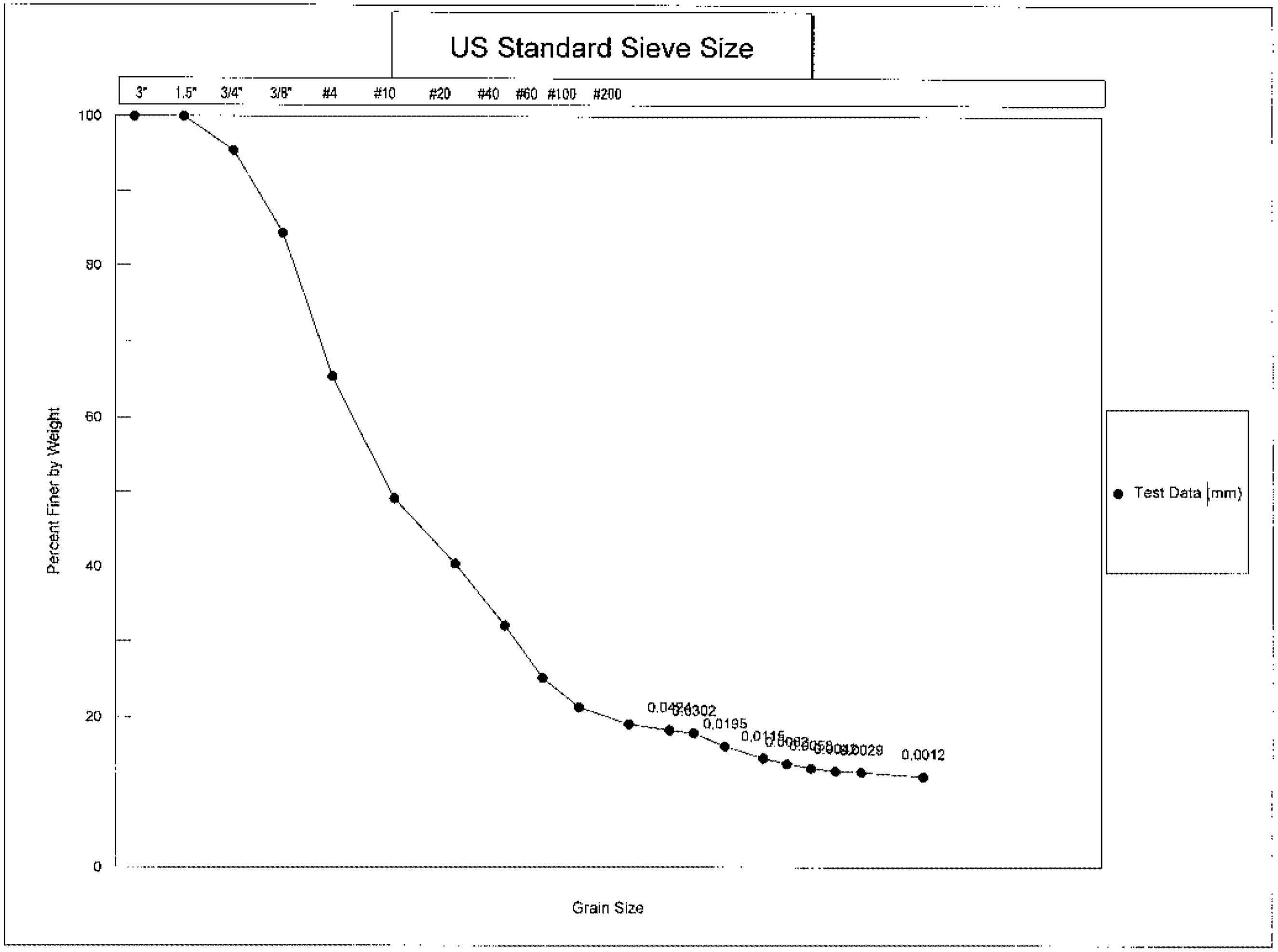
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.5 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01325 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 173.718 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 36.75 | 31.75 | 18.3 | 18.3 | 10.26 | 0.0424 |
| 2.0 | 36.00 | 31.00 | 17.8 | 17.8 | 10.39 | 0.0302 |
| 5.0 | 33.00 | 28.00 | 16.1 | 16.1 | 10.88 | 0.0195 |
| 15.0 | 30.25 | 25.25 | 14.5 | 14.5 | 11.33 | 0.0115 |
| 30.0 | 29.00 | 24.00 | 13.8 | 13.8 | 11.53 | 0.0082 |
| 60.0 | 28.00 | 23.00 | 13.2 | 13.2 | 11.70 | 0.0058 |
| 120.0 | 27.25 | 22.25 | 12.8 | 12.8 | 11.82 | 0.0042 |
| 250.0 | 27.00 | 22.00 | 12.7 | 12.7 | 11.86 | 0.0029 |
| 1440.0 | 26.00 | 21.00 | 12.1 | 12.1 | 12.03 | 0.0012 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/12/2012
Data checked by: Date: 10/12/12
FileName: LKH0NSZ2

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-A-006 Sample No.: 211A006GRNSZ2
Job Number: 2855-05 Depth:
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-05 |
| BORING NO. | 211-A-006 | SAMPLED | 09/26/12 KD |
| DEPTH | | DATE TESTED | 10/10/12 JS |
| SAMPLE NO. | 211A006GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 41.26 |
| Wt. Dry Soil & Pan (g) | | 40.84 |
| Wt. Lost Moisture (g) | | 0.42 |
| Wt. of Pan Only (g) | | 3.00 |
| Wt. of Dry Soil (g) | | 37.84 |
| Moisture Content % | | 1.1 |
| Wt. Hydrom. Sample Wet (g) | | 62.68 |
| Wt. Hydrom. Sample Dry (g) | | 61.99 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1241.91 |
| Weight of + #10 Before Washing (g) | 19.21 |
| Weight of + #10 After Washing (g) | 18.33 |
| Weight of - #10 Wet (g) | 1222.70 |
| Weight of - #10 Dry (g) | 1210.15 |
| Wt. Total Sample Dry (g) | 1228.48 |
| Calc. Wt. "W" (g) | 62.93 |
| Calc. Mass + #10 | 0.94 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 8.17 | 8.17 | 8.17 | 0.7 | 99.3 |
| 3/8" | 0.00 | 4.84 | 4.84 | 13.01 | 1.1 | 98.9 |
| #4 | 0.00 | 3.19 | 3.19 | 16.20 | 1.3 | 98.7 |
| #10 | 0.00 | 2.13 | 2.13 | 18.33 | 1.5 | 98.5 |
| #20 | 3.07 | 3.28 | 0.21 | 0.21 | 1.8 | 98.2 |
| #40 | 3.32 | 4.38 | 1.06 | 1.26 | 3.5 | 96.5 |
| #60 | 3.03 | 8.93 | 5.90 | 7.16 | 12.9 | 87.1 |
| #100 | 3.08 | 13.97 | 10.89 | 18.06 | 30.2 | 69.8 |
| #200 | 2.99 | 12.62 | 9.62 | 27.68 | 45.5 | 54.5 |

Data entered by: DAW Date: 10/12/2012
Data checked by: Date: 10/12/12
FileName: LKH0NSZ3

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-05 |
| BORING NO. | 211-A-006 | SAMPLED | 09/26/12 KD |
| DEPTH | | DATE TESTED | 10/10/12 JS |
| SAMPLE NO. | 211A006GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

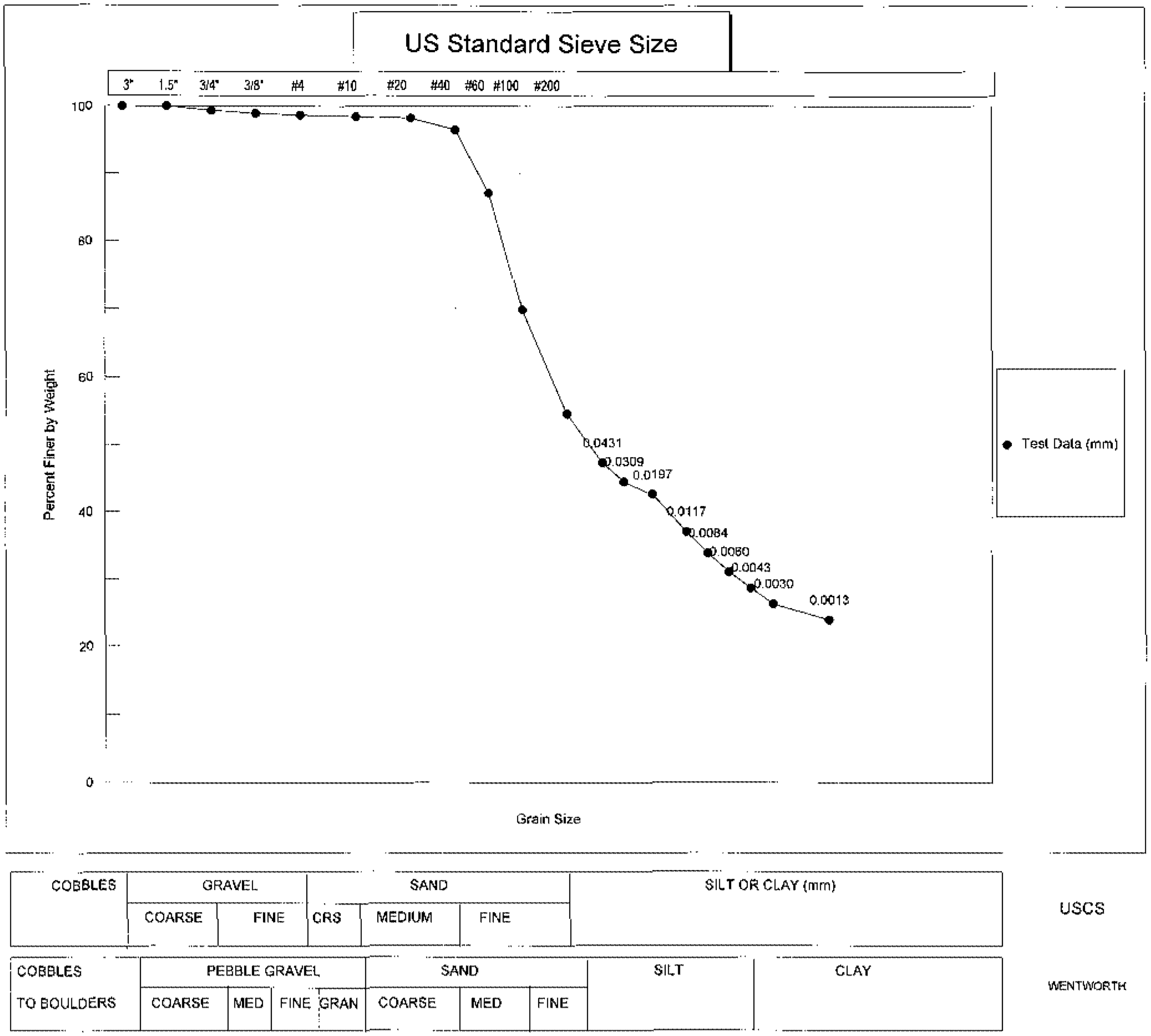
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.6 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01323 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 62.927 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 34.75 | 29.75 | 47.3 | 47.3 | 10.59 | 0.0431 |
| 2.0 | 33.00 | 28.00 | 44.5 | 44.5 | 10.88 | 0.0309 |
| 5.0 | 31.75 | 26.75 | 42.5 | 42.5 | 11.08 | 0.0197 |
| 15.0 | 28.25 | 23.25 | 36.9 | 36.9 | 11.66 | 0.0117 |
| 30.0 | 26.25 | 21.25 | 33.8 | 33.8 | 11.99 | 0.0084 |
| 60.0 | 24.50 | 19.50 | 31.0 | 31.0 | 12.27 | 0.0060 |
| 120.0 | 23.00 | 18.00 | 28.6 | 28.6 | 12.52 | 0.0043 |
| 250.0 | 21.50 | 16.50 | 26.2 | 26.2 | 12.76 | 0.0030 |
| 1440.0 | 20.00 | 15.00 | 23.8 | 23.8 | 13.01 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/12/2012
Data checked by: [signature] Date: 10/12/12
FileName: LKH0NSZ3

ADVANCED TERRA TESTING, INC. ATT




Client: LATA Kentucky Boring No.: 211-A-006 Sample No.: 211A006GRNSZ3

Job Number: 2855-05 Depth:

Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-2

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-002 | SAMPLED | 8/30/12 KD |
| DEPTH | 9-13' | DATE TESTED | 9/13/12 JS |
| SAMPLE NO. | 211A002GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 38.74 |
| Wt. Dry Soil & Pan (g) | | 37.31 |
| Wt. Lost Moisture (g) | | 1.43 |
| Wt. of Pan Only (g) | | 3.04 |
| Wt. of Dry Soil (g) | | 34.27 |
| Moisture Content % | | 4.2 |
| Wt. Hydrom. Sample Wet (g) | | 77.11 |
| Wt. Hydrom. Sample Dry (g) | | 74.02 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1213.18 |
| Weight of + #10 Before Washing (g) | 4.38 |
| Weight of + #10 After Washing (g) | 3.66 |
| Weight of - #10 Wet (g) | 1208.80 |
| Weight of - #10 Dry (g) | 1161.07 |
| Wt. Total Sample Dry (g) | 1164.73 |
| Calc. Wt. "W" (g) | 74.25 |
| Calc. Mass + #10 | 0.23 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 1.15 | 1.15 | 1.15 | 0.1 | 99.9 |
| #4 | 0.00 | 0.83 | 0.83 | 1.98 | 0.2 | 99.8 |
| #10 | 0.00 | 1.68 | 1.68 | 3.66 | 0.3 | 99.7 |
| #20 | 2.99 | 3.08 | 0.09 | 0.09 | 0.4 | 99.6 |
| #40 | 2.99 | 3.32 | 0.33 | 0.42 | 0.9 | 99.1 |
| #60 | 3.03 | 4.00 | 0.97 | 1.39 | 2.2 | 97.8 |
| #100 | 3.12 | 4.66 | 1.54 | 2.93 | 4.3 | 95.7 |
| #200 | 3.04 | 4.30 | 1.26 | 4.19 | 6.0 | 94.0 |

Data entered by: MLM Date: 09/17/2012
Data checked by: SM Date: 9/17/12
FileName: LKHYNS21

ADVANCED TERRA TESTING, INC. ATT

# HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-2 |
| BORING NO. | 211-A-002 | SAMPLED | 8/30/12 KD |
| DEPTH | 9-13' | DATE TESTED | 9/13/12 JS |
| SAMPLE NO. | 211A002GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

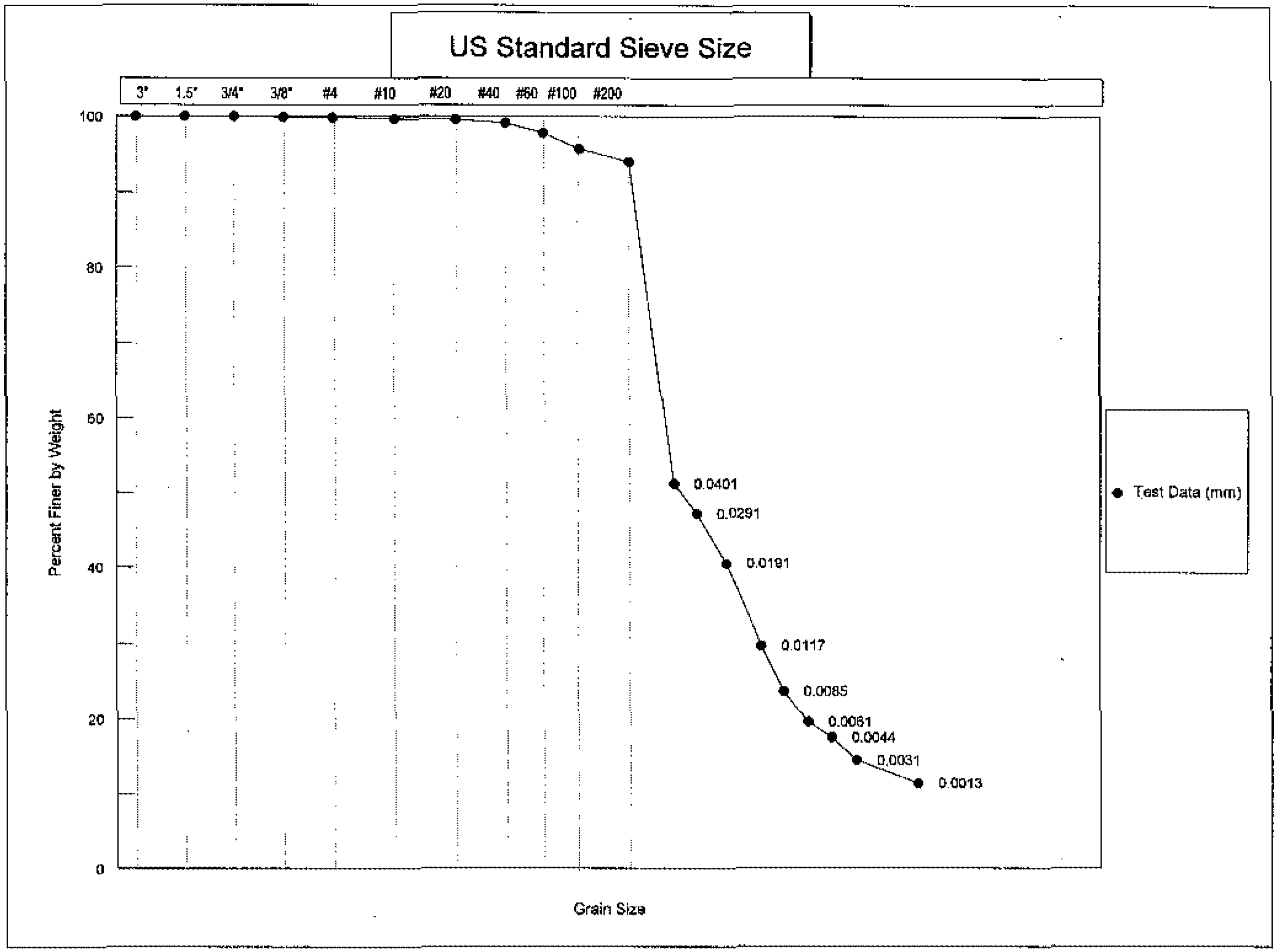
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.3 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01312 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 74.253 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 4.5 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 42.50 | 38.00 | 51.2 | 51.2 | 9.32 | 0.0401 |
| 2.0 | 39.50 | 35.00 | 47.1 | 47.1 | 9.81 | 0.0291 |
| 5.0 | 34.50 | 30.00 | 40.4 | 40.4 | 10.63 | 0.0191 |
| 15.0 | 26.50 | 22.00 | 29.6 | 29.6 | 11.94 | 0.0117 |
| 30.0 | 22.00 | 17.50 | 23.6 | 23.6 | 12.68 | 0.0085 |
| 60.0 | 19.00 | 14.50 | 19.5 | 19.5 | 13.17 | 0.0061 |
| 120.0 | 17.50 | 13.00 | 17.5 | 17.5 | 13.42 | 0.0044 |
| 250.0 | 15.25 | 10.75 | 14.5 | 14.5 | 13.79 | 0.0031 |
| 1440.0 | 13.00 | 8.50 | 11.4 | 11.4 | 14.16 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 09/17/2012
Data checked by: [signature] Date: 9/17/12
FileName: LKHYNS21

ADVANCED TERRA TESTING, INC.




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-A-002 Sample No.: 211A002GRNSZ1
Job Number: 2855-2 Depth: 9-13'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-2

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-002 | SAMPLED | 8/30/12 KD |
| DEPTH | 23-26' | DATE TESTED | 9/13/12 JS |
| SAMPLE NO. | 211A002GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 38.48 |
| Wt. Dry Soil & Pan (g) | | 38.00 |
| Wt. Lost Moisture (g) | | 0.48 |
| Wt. of Pan Only (g) | | 3.15 |
| Wt. of Dry Soil (g) | | 34.85 |
| Moisture Content % | | 1.4 |
| Wt. Hydrom. Sample Wet (g) | | 91.49 |
| Wt. Hydrom. Sample Dry (g) | | 90.25 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1087.63 |
| Weight of + #10 Before Washing (g) | 562.03 |
| Weight of + #10 After Washing (g) | 502.46 |
| Weight of - #10 Wet (g) | 525.60 |
| Weight of - #10 Dry (g) | 577.22 |
| Wt. Total Sample Dry (g) | 1079.68 |
| Calc. Wt. "W" (g) | 168.81 |
| Calc. Mass + #10 | 78.56 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 17.41 | 17.41 | 17.41 | 1.6 | 98.4 |
| 3/8" | 0.00 | 121.64 | 121.64 | 139.05 | 12.9 | 87.1 |
| #4 | 0.00 | 184.36 | 184.36 | 323.41 | 30.0 | 70.0 |
| #10 | 0.00 | 179.05 | 179.05 | 502.46 | 46.5 | 53.5 |
| #20 | 3.02 | 17.88 | 14.87 | 14.87 | 55.3 | 44.7 |
| #40 | 3.11 | 16.68 | 13.56 | 28.43 | 63.4 | 36.6 |
| #60 | 3.06 | 18.07 | 15.01 | 43.43 | 72.3 | 27.7 |
| #100 | 2.99 | 14.19 | 11.20 | 54.64 | 78.9 | 21.1 |
| #200 | 3.09 | 8.81 | 5.72 | 60.36 | 82.3 | 17.7 |

Data entered by: MLM Date: 09/17/2012
Data checked by: sll Date: 9/17/12
FileName: LKHYNS22

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-2 |
| BORING NO. | 211-A-002 | SAMPLED | 8/30/12 KD |
| DEPTH | 23-26' | DATE TESTED | 9/13/12 JS |
| SAMPLE NO. | 211A002GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

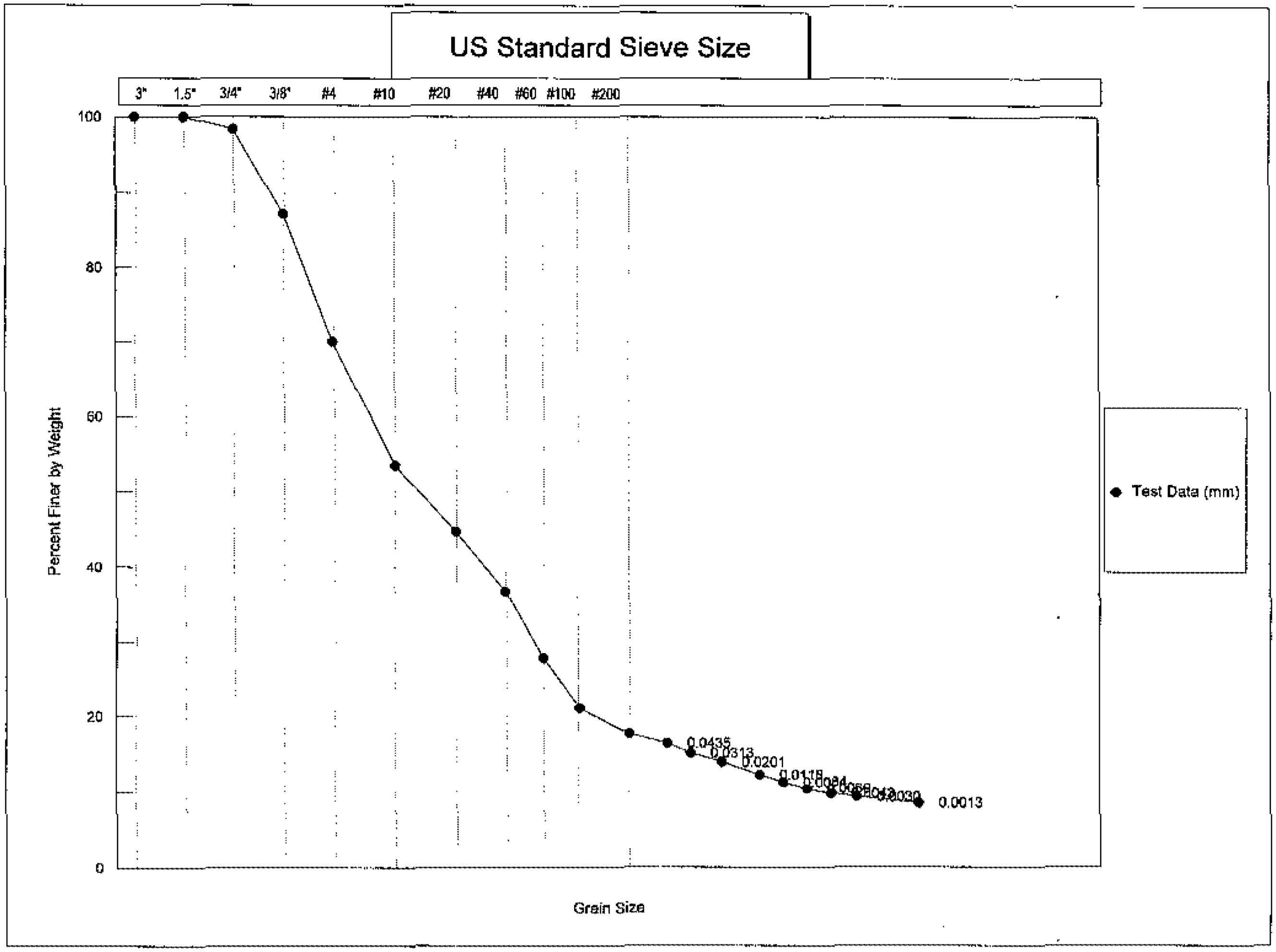
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.3 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01312 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 168.807 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 4.5 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 32.25 | 27.75 | 16.4 | 16.4 | 11.00 | 0.0435 |
| 2.0 | 30.00 | 25.50 | 15.1 | 15.1 | 11.37 | 0.0313 |
| 5.0 | 28.00 | 23.50 | 13.9 | 13.9 | 11.70 | 0.0201 |
| 15.0 | 25.25 | 20.75 | 12.3 | 12.3 | 12.15 | 0.0118 |
| 30.0 | 23.50 | 19.00 | 11.3 | 11.3 | 12.44 | 0.0084 |
| 60.0 | 22.00 | 17.50 | 10.4 | 10.4 | 12.68 | 0.0060 |
| 120.0 | 21.00 | 16.50 | 9.8 | 9.8 | 12.85 | 0.0043 |
| 250.0 | 20.25 | 15.75 | 9.3 | 9.3 | 12.97 | 0.0030 |
| 1440.0 | 19.00 | 14.50 | 8.6 | 8.6 | 13.17 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: Sll MLM Date: 09/17/2012
Data checked by: Sll Date: 9/17/12
FileName: LKHYNS22

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky  Boring No.: 211-A-002  Sample No.: 211A002GRNSZ2
Job Number: 2855-2  Depth: 23-26'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-2

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-002 | SAMPLED | 8/30/12 KD |
| DEPTH | 37.4-39.0' | DATE TESTED | 9/13/12 JS |
| SAMPLE NO. | 211A002GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 37.39 |
| Wt. Dry Soil & Pan (g) | 36.68 |
| Wt. Lost Moisture (g) | 0.71 |
| Wt. of Pan Only (g) | 2.98 |
| Wt. of Dry Soil (g) | 33.70 |
| Moisture Content % | 2.1 |
| Wt. Hydrom. Sample Wet (g) | 70.65 |
| Wt. Hydrom. Sample Dry (g) | 69.19 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 842.64 |
| Weight of + #10 Before Washing (g) | 1.54 |
| Weight of + #10 After Washing (g) | 1.36 |
| Weight of - #10 Wet (g) | 841.10 |
| Weight of - #10 Dry (g) | 823.92 |
| Wt. Total Sample Dry (g) | 825.28 |
| Calc. Wt. "W" (g) | 69.31 |
| Calc. Mass + #10 | 0.11 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 0.48 | 0.48 | 0.48 | 0.1 | 99.9 |
| #10 | 0.00 | 0.88 | 0.88 | 1.36 | 0.2 | 99.8 |
| #20 | 3.23 | 3.44 | 0.21 | 0.21 | 0.5 | 99.5 |
| #40 | 3.12 | 4.35 | 1.22 | 1.43 | 2.2 | 97.8 |
| #60 | 3.25 | 7.71 | 4.46 | 5.89 | 8.7 | 91.3 |
| #100 | 3.05 | 8.12 | 5.07 | 10.96 | 16.0 | 84.0 |
| #200 | 2.98 | 7.40 | 4.42 | 15.38 | 22.4 | 77.6 |

Data entered by: Sll MLM Date: 09/17/2012
Data checked by: Sll Date: 9/17/12
FileName: LKHYNS23

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-2

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-002 | SAMPLED | 8/30/12 KD |
| DEPTH | 37.4-39.0' | DATE TESTED | 9/13/12 JS |
| SAMPLE NO. | 211A002GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

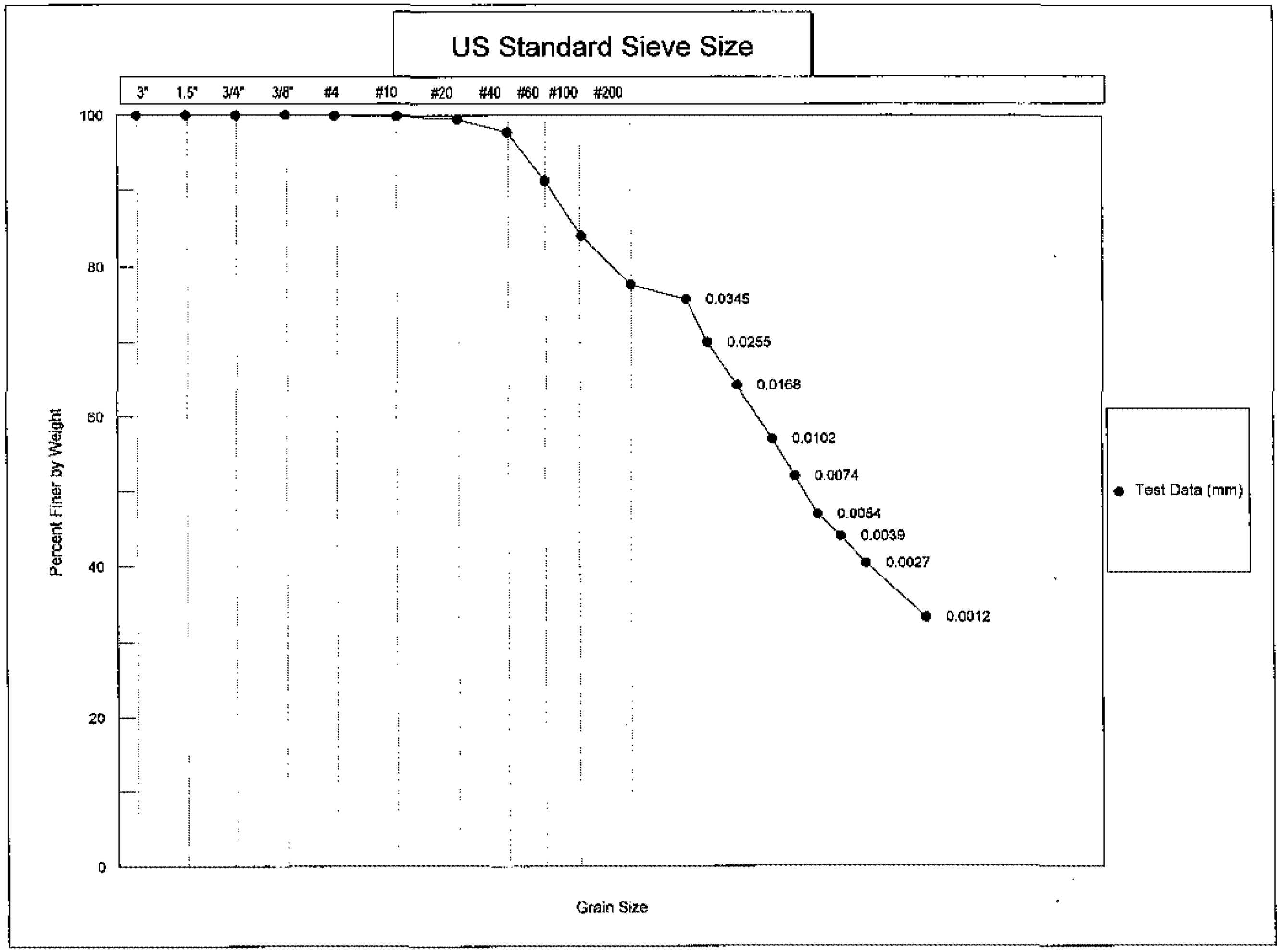
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.4 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01311 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 69.306 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 4.5 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 57.00 | 52.50 | 75.8 | 75.8 | 6.94 | 0.0345 |
| 2.0 | 53.00 | 48.50 | 70.0 | 70.0 | 7.60 | 0.0255 |
| 5.0 | 49.00 | 44.50 | 64.2 | 64.2 | 8.25 | 0.0168 |
| 15.0 | 44.00 | 39.50 | 57.0 | 57.0 | 9.07 | 0.0102 |
| 30.0 | 40.50 | 36.00 | 51.9 | 51.9 | 9.65 | 0.0074 |
| 60.0 | 37.00 | 32.50 | 46.9 | 46.9 | 10.22 | 0.0054 |
| 120.0 | 35.00 | 30.50 | 44.0 | 44.0 | 10.55 | 0.0039 |
| 250.0 | 32.50 | 28.00 | 40.4 | 40.4 | 10.96 | 0.0027 |
| 1440.0 | 27.50 | 23.00 | 33.2 | 33.2 | 11.78 | 0.0012 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 09/17/2012
Data checked by: sll Date: 9/17/12
FileName: LKHYNS23

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky  Boring No.: 211-A-002  Sample No.: 211A002GRNSZ3
Job Number: 2855-2  Depth: 37.4-39.0'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 KD |
| DEPTH | 12-15' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A012GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 43.29 |
| Wt. Dry Soil & Pan (g) | | 42.55 |
| Wt. Lost Moisture (g) | | 0.74 |
| Wt. of Pan Only (g) | | 3.03 |
| Wt. of Dry Soil (g) | | 39.52 |
| Moisture Content % | | 1.9 |
| Wt. Hydrom. Sample Wet (g) | | 66.99 |
| Wt. Hydrom. Sample Dry (g) | | 65.76 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1107.23 |
| Weight of + #10 Before Washing (g) | 4.40 |
| Weight of + #10 After Washing (g) | 4.22 |
| Weight of - #10 Wet (g) | 1102.83 |
| Weight of - #10 Dry (g) | 1082.74 |
| Wt. Total Sample Dry (g) | 1086.96 |
| Calc. Wt. "W" (g) | 66.02 |
| Calc. Mass + #10 | 0.26 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 2.96 | 2.96 | 2.96 | 0.3 | 99.7 |
| #4 | 0.00 | 0.93 | 0.93 | 3.89 | 0.4 | 99.6 |
| #10 | 0.00 | 0.33 | 0.33 | 4.22 | 0.4 | 99.6 |
| #20 | 1.78 | 1.83 | 0.05 | 0.05 | 0.5 | 99.5 |
| #40 | 1.79 | 2.14 | 0.35 | 0.40 | 1.0 | 99.0 |
| #60 | 1.77 | 3.04 | 1.27 | 1.67 | 2.9 | 97.1 |
| #100 | 1.80 | 3.62 | 1.82 | 3.49 | 5.7 | 94.3 |
| #200 | 1.77 | 3.10 | 1.33 | 4.82 | 7.7 | 92.3 |

Data entered by: CM DAW    Date: 10/04/2012
Data checked by: CM    Date: 10/4/12
FileName: LKH01215

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 KD |
| DEPTH | 12-15' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A012GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

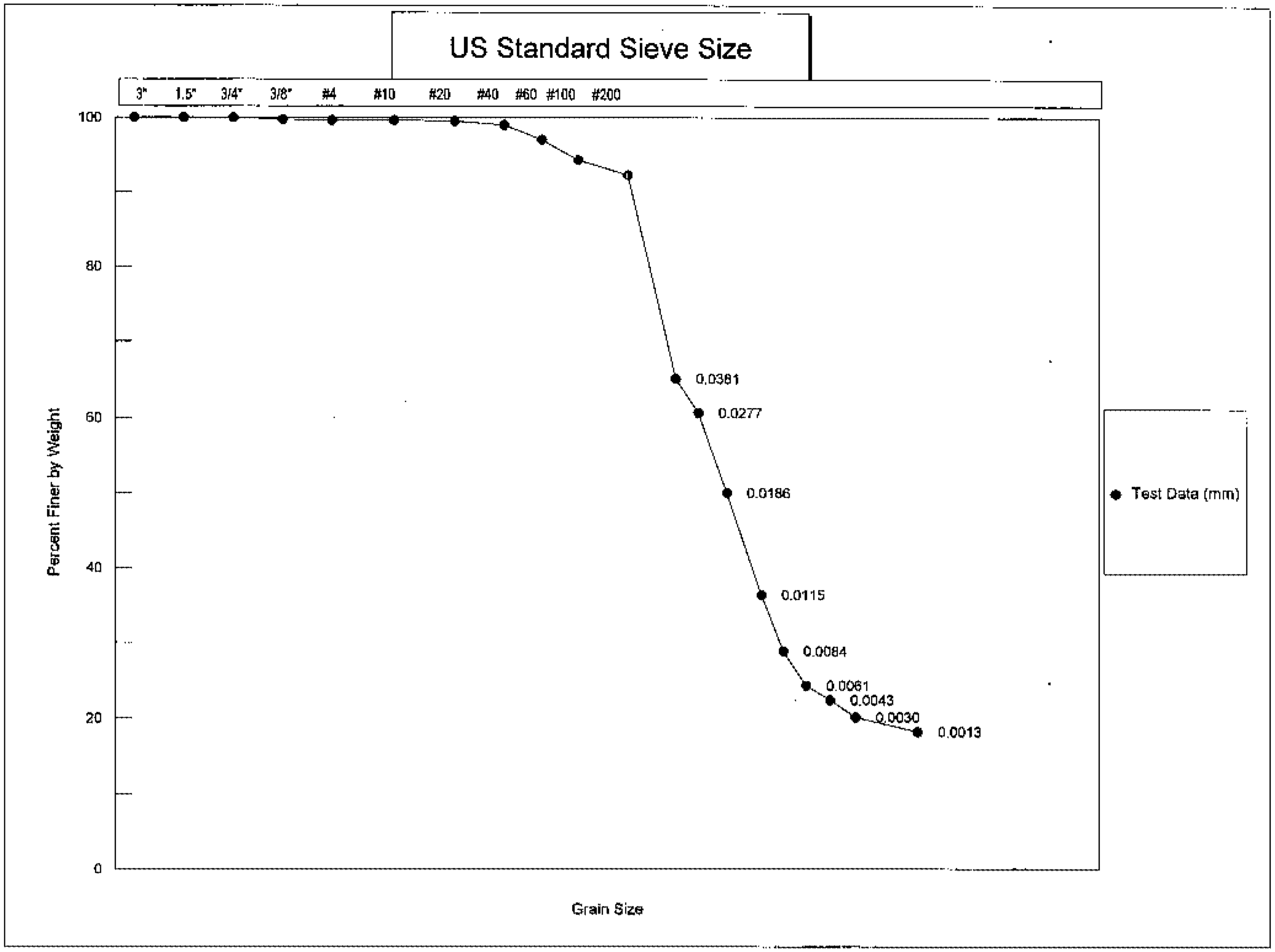
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.2 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01314 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 66.016 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 48.00 | 43.00 | 65.1 | 65.1 | 8.42 | 0.0381 |
| 2.0 | 45.00 | 40.00 | 60.6 | 60.6 | 8.91 | 0.0277 |
| 5.0 | 38.00 | 33.00 | 50.0 | 50.0 | 10.06 | 0.0186 |
| 15.0 | 29.00 | 24.00 | 36.4 | 36.4 | 11.53 | 0.0115 |
| 30.0 | 24.00 | 19.00 | 28.8 | 28.8 | 12.35 | 0.0084 |
| 60.0 | 21.00 | 16.00 | 24.2 | 24.2 | 12.85 | 0.0061 |
| 120.0 | 19.75 | 14.75 | 22.3 | 22.3 | 13.05 | 0.0043 |
| 250.0 | 18.25 | 13.25 | 20.1 | 20.1 | 13.30 | 0.0030 |
| 1440.0 | 17.00 | 12.00 | 18.2 | 18.2 | 13.50 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/04/2012
Data checked by: Date: 10/4/12
FileName: LKH01215

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| TO BOULDERS | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-A-012 Sample No.: 211A012GRNSZ1

Job Number: 2855-03 Depth: 12-15'

Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-03

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 KD |
| DEPTH | 20-23' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A012 GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 35.67 |
| Wt. Dry Soil & Pan (g) | | 34.93 |
| Wt. Lost Moisture (g) | | 0.74 |
| Wt. of Pan Only (g) | | 3.08 |
| Wt. of Dry Soil (g) | | 31.85 |
| Moisture Content % | | 2.3 |
| Wt. Hydrom. Sample Wet (g) | | 71.84 |
| Wt. Hydrom. Sample Dry (g) | | 70.21 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1023.88 |
| Weight of + #10 Before Washing (g) | 122.94 |
| Weight of + #10 After Washing (g) | 85.39 |
| Weight of - #10 Wet (g) | 900.94 |
| Weight of - #10 Dry (g) | 917.18 |
| Wt. Total Sample Dry (g) | 1002.57 |
| Calc. Wt. "W" (g) | 76.75 |
| Calc. Mass + #10 | 6.54 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 20.30 | 20.30 | 20.30 | 2.0 | 98.0 |
| #4 | 0.00 | 38.42 | 38.42 | 58.72 | 5.9 | 94.1 |
| #10 | 0.00 | 26.67 | 26.67 | 85.39 | 8.5 | 91.5 |
| #20 | 1.78 | 3.64 | 1.86 | 1.86 | 10.9 | 89.1 |
| #40 | 1.75 | 6.01 | 4.26 | 6.12 | 16.5 | 83.5 |
| #60 | 1.76 | 11.75 | 9.99 | 16.11 | 29.5 | 70.5 |
| #100 | 1.78 | 8.69 | 6.91 | 23.02 | 38.5 | 61.5 |
| #200 | 1.78 | 4.95 | 3.17 | 26.19 | 42.6 | 57.4 |

Data entered by: DAW Date: 10/04/2012
Data checked by: sll Date: 10/4/12
FileName: LKH02023

ADVANCED TERRA TESTING, Inc. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 KD |
| DEPTH | 20-23' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A012 GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

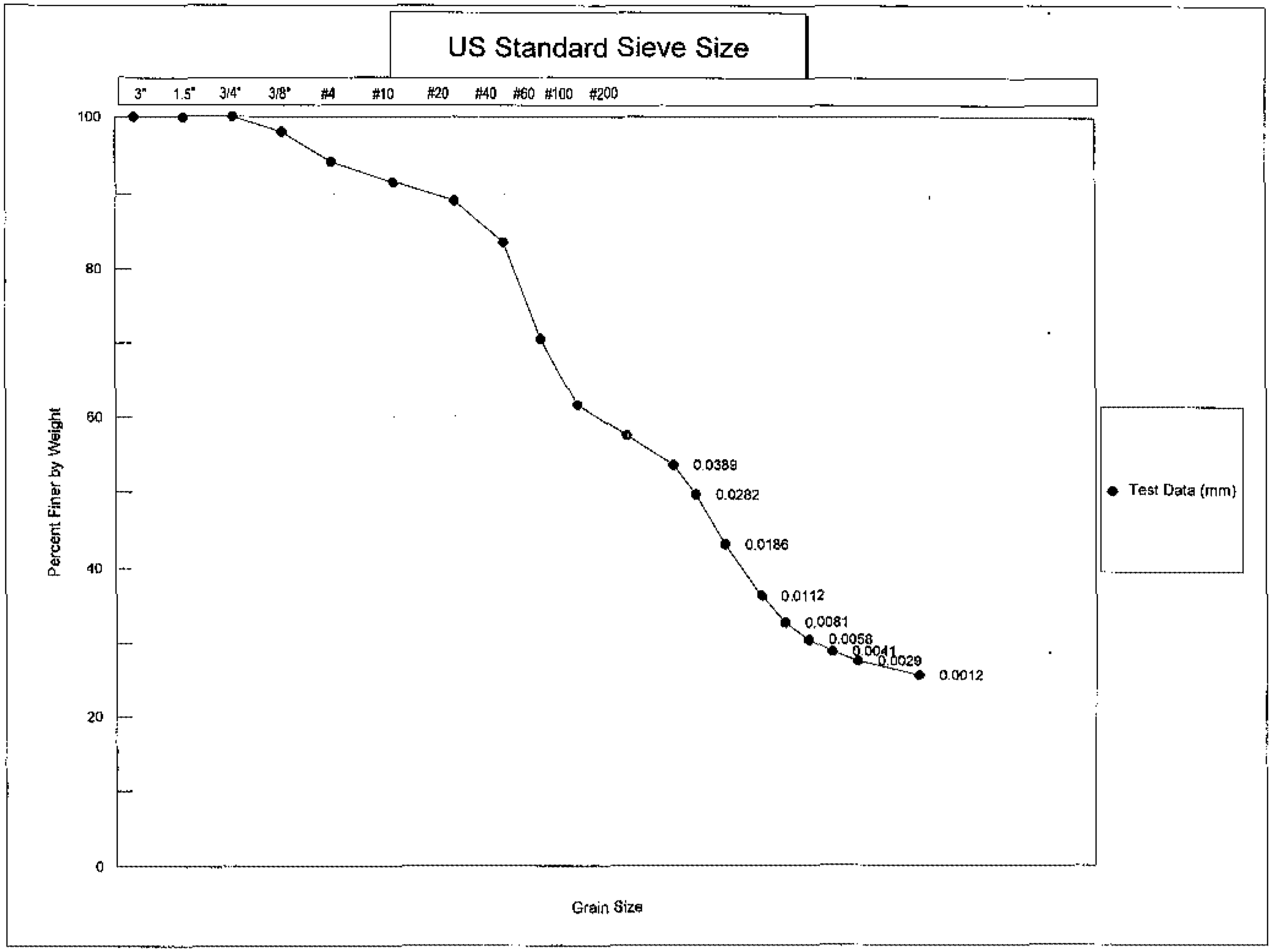
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.2 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01314 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 76.747 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 46.00 | 41.00 | 53.4 | 53.4 | 8.75 | 0.0389 |
| 2.0 | 43.00 | 38.00 | 49.5 | 49.5 | 9.24 | 0.0282 |
| 5.0 | 38.00 | 33.00 | 43.0 | 43.0 | 10.06 | 0.0186 |
| 15.0 | 32.75 | 27.75 | 36.2 | 36.2 | 10.92 | 0.0112 |
| 30.0 | 30.00 | 25.00 | 32.6 | 32.6 | 11.37 | 0.0081 |
| 60.0 | 28.25 | 23.25 | 30.3 | 30.3 | 11.66 | 0.0058 |
| 120.0 | 27.00 | 22.00 | 28.7 | 28.7 | 11.86 | 0.0041 |
| 250.0 | 26.00 | 21.00 | 27.4 | 27.4 | 12.03 | 0.0029 |
| 1440.0 | 24.50 | 19.50 | 25.4 | 25.4 | 12.27 | 0.0012 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/04/2012
Data checked by: Date: 10/4/12
FileName: LKH02023

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky
Job Number: 2855-03
Classification: **Classification Not Performed**

Boring No.: 211-A-012
Depth: 20-23'

Sample No.: 211A012 GRNSZ2

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-03

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 KD |
| DEPTH | 40-42' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A012GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 35.86 |
| Wt. Dry Soil & Pan (g) | 35.35 |
| Wt. Lost Moisture (g) | 0.51 |
| Wt. of Pan Only (g) | 3.06 |
| Wt. of Dry Soil (g) | 32.29 |
| Moisture Content % | 1.6 |
| Wt. Hydrom. Sample Wet (g) | 71.16 |
| Wt. Hydrom. Sample Dry (g) | 70.06 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1243.67 |
| Weight of + #10 Before Washing (g) | 7.17 |
| Weight of + #10 After Washing (g) | 6.35 |
| Weight of - #10 Wet (g) | 1236.50 |
| Weight of - #10 Dry (g) | 1218.08 |
| Wt. Total Sample Dry (g) | 1224.43 |
| Calc. Wt. "W" (g) | 70.42 |
| Calc. Mass + #10 | 0.37 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 1.76 | 1.76 | 1.76 | 0.1 | 99.9 |
| #10 | 0.00 | 4.59 | 4.59 | 6.35 | 0.5 | 99.5 |
| #20 | 1.78 | 2.84 | 1.06 | 1.06 | 2.0 | 98.0 |
| #40 | 1.78 | 5.92 | 4.14 | 5.20 | 7.9 | 92.1 |
| #60 | 1.78 | 9.68 | 7.90 | 13.10 | 19.1 | 80.9 |
| #100 | 1.79 | 11.09 | 9.30 | 22.40 | 32.3 | 67.7 |
| #200 | 1.78 | 10.51 | 8.73 | 31.13 | 44.7 | 55.3 |

Data entered by: DAW Date: 10/04/2012
Data checked by: Date: 10/4/12
FileName: LKH04042

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 KD |
| DEPTH | 40-42' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A012GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

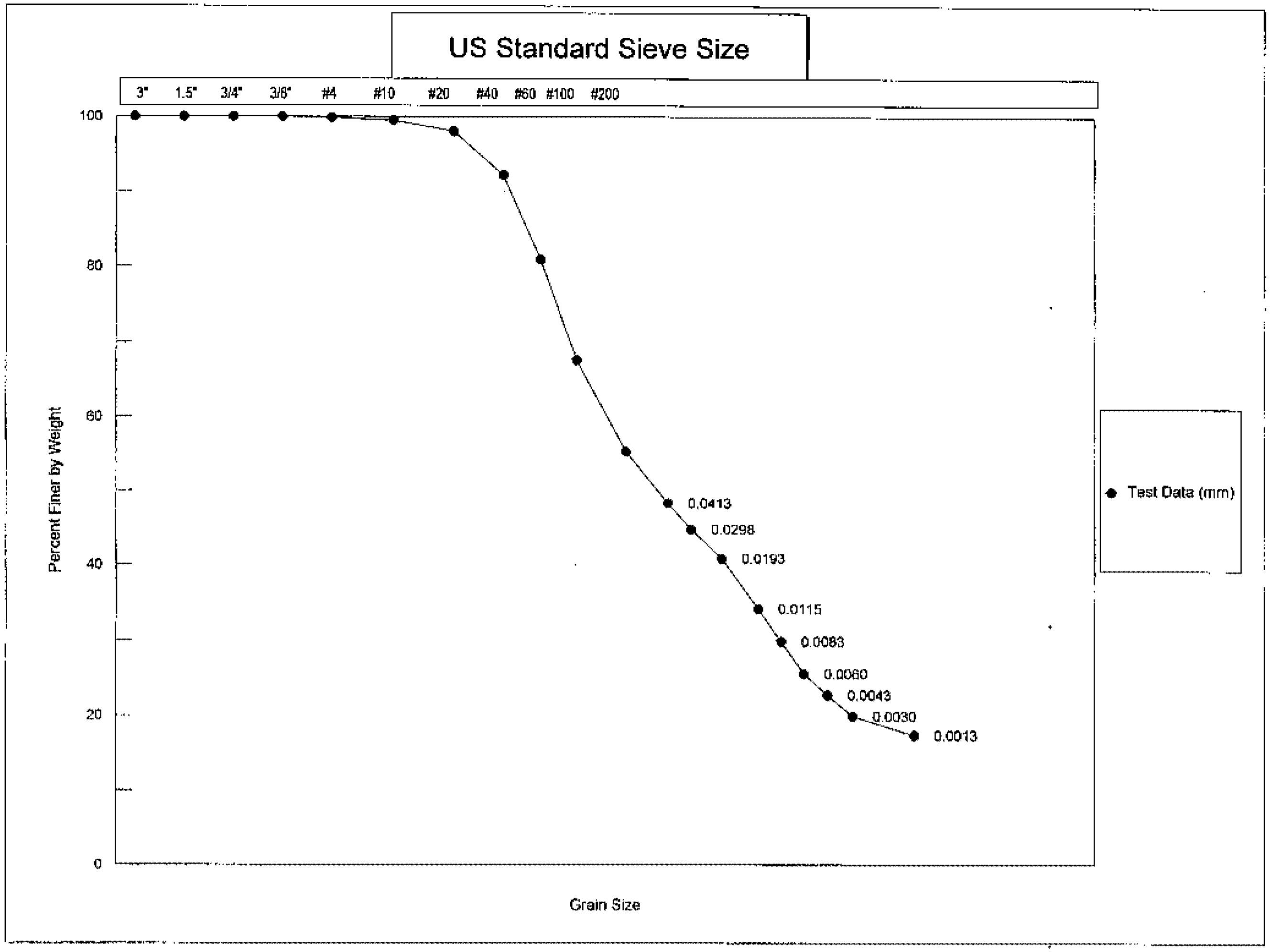
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.2 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01314 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 70.422 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 39.00 | 34.00 | 48.3 | 48.3 | 9.89 | 0.0413 |
| 2.0 | 36.50 | 31.50 | 44.7 | 44.7 | 10.30 | 0.0298 |
| 5.0 | 33.75 | 28.75 | 40.8 | 40.8 | 10.76 | 0.0193 |
| 15.0 | 29.00 | 24.00 | 34.1 | 34.1 | 11.53 | 0.0115 |
| 30.0 | 26.00 | 21.00 | 29.8 | 29.8 | 12.03 | 0.0083 |
| 60.0 | 23.00 | 18.00 | 25.6 | 25.6 | 12.52 | 0.0060 |
| 120.0 | 21.00 | 16.00 | 22.7 | 22.7 | 12.85 | 0.0043 |
| 250.0 | 19.00 | 14.00 | 19.9 | 19.9 | 13.17 | 0.0030 |
| 1440.0 | 17.25 | 12.25 | 17.4 | 17.4 | 13.46 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/04/2012
Data checked by: Date: 10/4/12
FileName: LKH04042

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-A-012 Sample No.: 211A012GRNSZ3
Job Number: 2855-03 Depth: 40-42'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 KD |
| DEPTH | 12-15' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A027GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 32.07 |
| Wt. Dry Soil & Pan (g) | 31.27 |
| Wt. Lost Moisture (g) | 0.80 |
| Wt. of Pan Only (g) | 3.09 |
| Wt. of Dry Soil (g) | 28.18 |
| Moisture Content % | 2.8 |
| Wt. Hydrom. Sample Wet (g) | 66.90 |
| Wt. Hydrom. Sample Dry (g) | 65.05 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1074.24 |
| Weight of + #10 Before Washing (g) | 0.34 |
| Weight of + #10 After Washing (g) | 0.29 |
| Weight of - #10 Wet (g) | 1073.90 |
| Weight of - #10 Dry (g) | 1044.30 |
| Wt. Total Sample Dry (g) | 1044.59 |
| Calc. Wt. "W" (g) | 65.07 |
| Calc. Mass + #10 | 0.02 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #10 | 0.00 | 0.29 | 0.29 | 0.29 | 0.0 | 100.0 |
| #20 | 3.01 | 3.09 | 0.08 | 0.08 | 0.1 | 99.9 |
| #40 | 3.19 | 3.66 | 0.47 | 0.55 | 0.9 | 99.1 |
| #60 | 3.05 | 5.41 | 2.36 | 2.91 | 4.5 | 95.5 |
| #100 | 3.08 | 7.07 | 3.99 | 6.90 | 10.6 | 89.4 |
| #200 | 3.07 | 5.54 | 2.47 | 9.37 | 14.4 | 85.6 |

Data entered by: DAW Date: 10/05/2012
Data checked by: sdl Date: 10/5/12
FileName: LKHU1215

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-03

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 KD |
| DEPTH | 12-15' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A027GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ER\12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

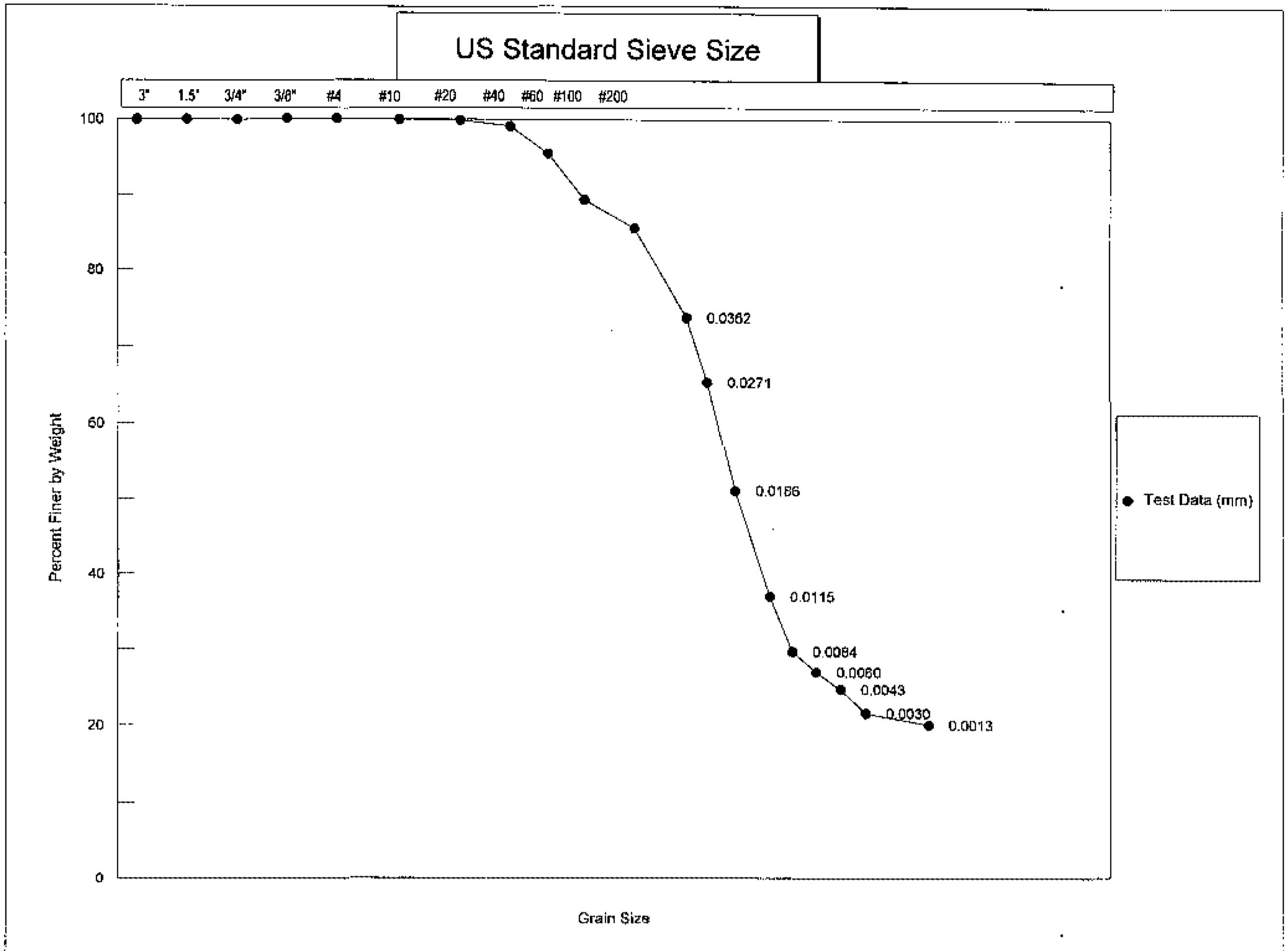
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.3 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01312 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 65.069 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 53.00 | 48.00 | 73.8 | 73.8 | 7.60 | 0.0362 |
| 2.0 | 47.50 | 42.50 | 65.3 | 65.3 | 8.50 | 0.0271 |
| 5.0 | 38.25 | 33.25 | 51.1 | 51.1 | 10.02 | 0.0186 |
| 15.0 | 29.00 | 24.00 | 36.9 | 36.9 | 11.53 | 0.0115 |
| 30.0 | 24.25 | 19.25 | 29.6 | 29.6 | 12.31 | 0.0084 |
| 60.0 | 22.50 | 17.50 | 26.9 | 26.9 | 12.60 | 0.0060 |
| 120.0 | 21.00 | 16.00 | 24.6 | 24.6 | 12.85 | 0.0043 |
| 250.0 | 19.00 | 14.00 | 21.5 | 21.5 | 13.17 | 0.0030 |
| 1440.0 | 18.00 | 13.00 | 20.0 | 20.0 | 13.34 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/05/2012
Data checked by: [signature] Date: 10/5/12
FileName: LKHU1215

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky    Boring No.: 211-A-027    Sample No.: 211A027GRNSZ1
Job Number: 2855-03    Depth: 12-15'
Classification: <u>Classification Not Performed</u>

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 JS |
| DEPTH | 22-25' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A027GRNZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 33.43 |
| Wt. Dry Soil & Pan (g) | | 32.67 |
| Wt. Lost Moisture (g) | | 0.76 |
| Wt. of Pan Only (g) | | 3.07 |
| Wt. of Dry Soil (g) | | 29.60 |
| Moisture Content % | | 2.6 |
| Wt. Hydrom. Sample Wet (g) | | 86.92 |
| Wt. Hydrom. Sample Dry (g) | | 84.74 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 745.33 |
| Weight of + #10 Before Washing (g) | 208.89 |
| Weight of + #10 After Washing (g) | 169.94 |
| Weight of - #10 Wet (g) | 536.44 |
| Weight of - #10 Dry (g) | 560.99 |
| Wt. Total Sample Dry (g) | 730.93 |
| Calc. Wt. "W" (g) | 110.41 |
| Calc. Mass + #10 | 25.67 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 22.89 | 22.89 | 22.89 | 3.1 | 96.9 |
| 3/8" | 0.00 | 48.61 | 48.61 | 71.50 | 9.8 | 90.2 |
| #4 | 0.00 | 53.80 | 53.80 | 125.30 | 17.1 | 82.9 |
| #10 | 0.00 | 44.64 | 44.64 | 169.94 | 23.2 | 76.8 |
| #20 | 3.01 | 7.83 | 4.82 | 4.82 | 27.6 | 72.4 |
| #40 | 3.12 | 12.75 | 9.64 | 14.45 | 36.3 | 63.7 |
| #60 | 3.12 | 15.51 | 12.40 | 26.85 | 47.6 | 52.4 |
| #100 | 3.05 | 12.36 | 9.31 | 36.16 | 56.0 | 44.0 |
| #200 | 3.02 | 6.57 | 3.55 | 39.70 | 59.2 | 40.8 |

Data entered by: DAW Date: 10/05/2012
Data checked by: Date: 10/5/12
FileName: LKHU2225

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 JS |
| DEPTH | 22-25' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A027GRNZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

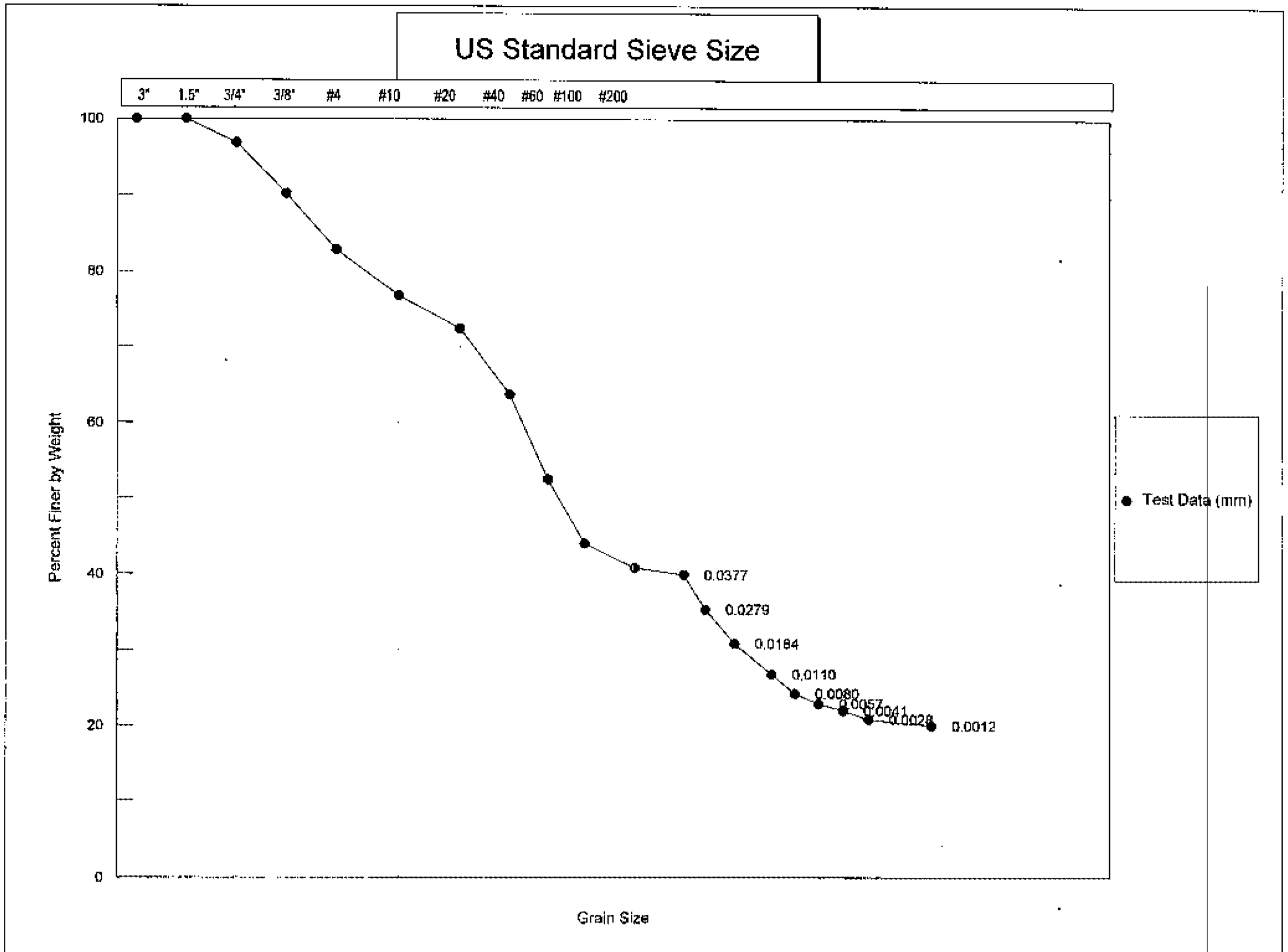
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.4 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01311 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 110.414 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 49.00 | 44.00 | 39.8 | 39.8 | 8.25 | 0.0377 |
| 2.0 | 44.00 | 39.00 | 35.3 | 35.3 | 9.07 | 0.0279 |
| 5.0 | 39.00 | 34.00 | 30.8 | 30.8 | 9.89 | 0.0184 |
| 15.0 | 34.50 | 29.50 | 26.7 | 26.7 | 10.63 | 0.0110 |
| 30.0 | 31.75 | 26.75 | 24.2 | 24.2 | 11.08 | 0.0080 |
| 60.0 | 30.25 | 25.25 | 22.9 | 22.9 | 11.33 | 0.0057 |
| 120.0 | 29.25 | 24.25 | 22.0 | 22.0 | 11.49 | 0.0041 |
| 250.0 | 28.00 | 23.00 | 20.8 | 20.8 | 11.70 | 0.0028 |
| 1440.0 | 27.00 | 22.00 | 19.9 | 19.9 | 11.86 | 0.0012 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/05/2012
Data checked by: Date: 10/5/12
FileName: LKHU2225

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-A-027 Sample No.: 211A027GRNZ2
Job Number: 2855-03 Depth: 22-25'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-03

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 KD |
| DEPTH | 35.5-37' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A027GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 34.83 |
| Wt. Dry Soil & Pan (g) | | 34.66 |
| Wt. Lost Moisture (g) | | 0.17 |
| Wt. of Pan Only (g) | | 3.06 |
| Wt. of Dry Soil (g) | | 31.60 |
| Moisture Content % | | 0.5 |
| Wt. Hydrom. Sample Wet (g) | | 89.44 |
| Wt. Hydrom. Sample Dry (g) | | 88.96 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1121.88 |
| Weight of + #10 Before Washing (g) | 491.75 |
| Weight of + #10 After Washing (g) | 462.56 |
| Weight of - #10 Wet (g) | 630.13 |
| Weight of - #10 Dry (g) | 655.79 |
| Wt. Total Sample Dry (g) | 1118.35 |
| Calc. Wt. "W" (g) | 151.72 |
| Calc. Mass + #10 | 62.75 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 11.05 | 11.05 | 11.05 | 1.0 | 99.0 |
| 3/8" | 0.00 | 177.82 | 177.82 | 188.87 | 16.9 | 83.1 |
| #4 | 0.00 | 157.69 | 157.69 | 346.56 | 31.0 | 69.0 |
| #10 | 0.00 | 116.00 | 116.00 | 462.56 | 41.4 | 58.6 |
| #20 | 3.11 | 13.47 | 10.36 | 10.36 | 48.2 | 51.8 |
| #40 | 2.96 | 22.16 | 19.20 | 29.56 | 60.8 | 39.2 |
| #60 | 3.03 | 27.11 | 24.07 | 53.63 | 76.7 | 23.3 |
| #100 | 2.99 | 17.11 | 14.11 | 67.75 | 86.0 | 14.0 |
| #200 | 3.07 | 8.03 | 4.96 | 72.71 | 89.3 | 10.7 |

Data entered by: DAW Date: 10/05/2012
Data checked by: SAU Date: 10/5/12
FileName: LKHU3537

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-03 |
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 KD |
| DEPTH | 35.5-37' | DATE TESTED | 10/02/12 JS |
| SAMPLE NO. | 211A027GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211A | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

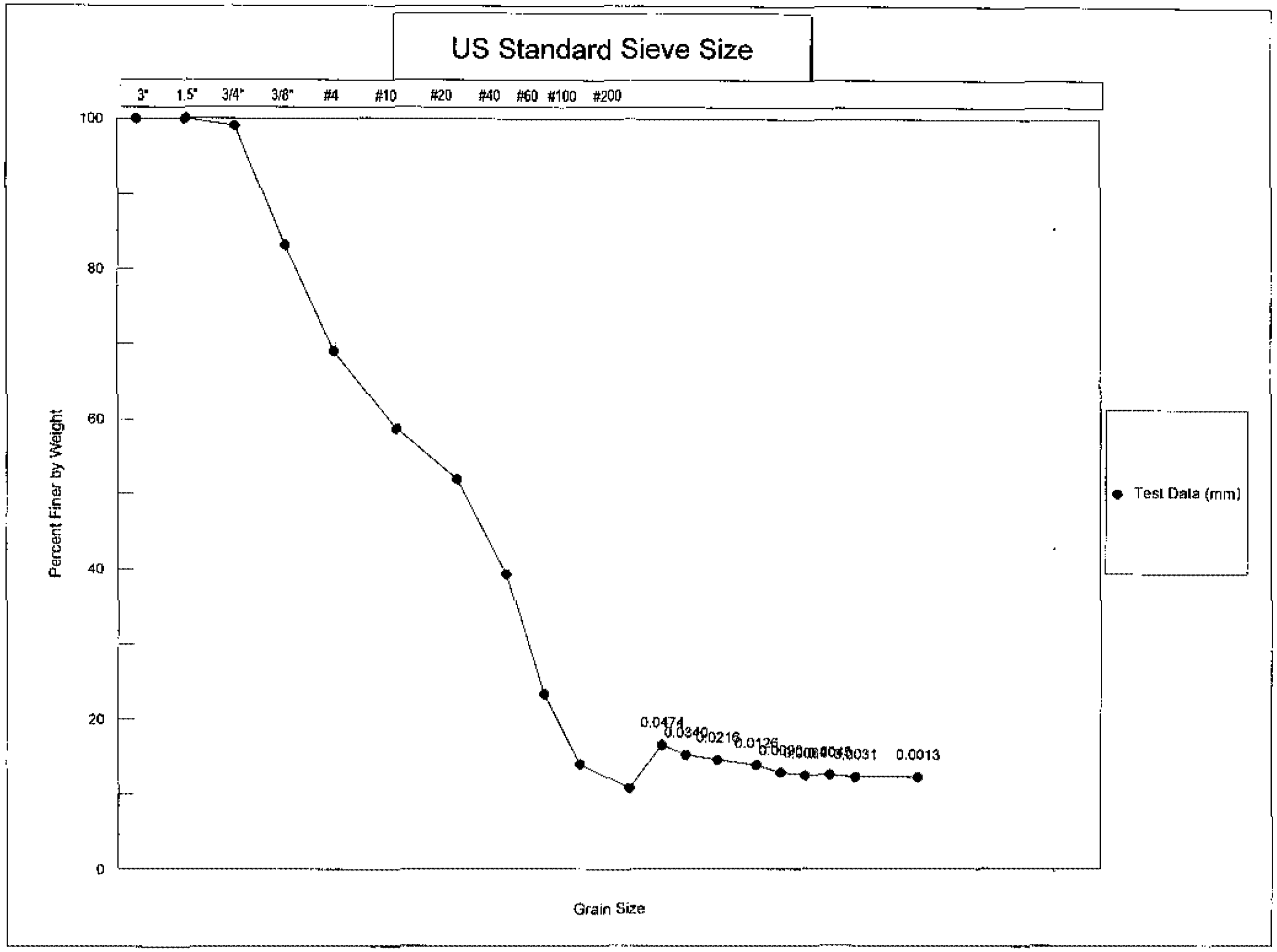
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 23.1 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01315 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 151.715 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 0.0 | | |
| Meniscus Corr'n | 5.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 20.00 | 25.00 | 16.5 | 16.5 | 13.01 | 0.0474 |
| 2.0 | 18.00 | 23.00 | 15.2 | 15.2 | 13.34 | 0.0340 |
| 5.0 | 17.00 | 22.00 | 14.5 | 14.5 | 13.50 | 0.0216 |
| 15.0 | 16.00 | 21.00 | 13.8 | 13.8 | 13.67 | 0.0126 |
| 30.0 | 14.50 | 19.50 | 12.9 | 12.9 | 13.91 | 0.0090 |
| 60.0 | 14.00 | 19.00 | 12.5 | 12.5 | 13.99 | 0.0064 |
| 120.0 | 14.00 | 19.00 | 12.5 | 12.5 | 13.99 | 0.0045 |
| 250.0 | 13.50 | 18.50 | 12.2 | 12.2 | 14.08 | 0.0031 |
| 1440.0 | 13.50 | 18.50 | 12.2 | 12.2 | 14.08 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: DAW Date: 10/05/2012
Data checked by: SW Date: 10/5/12
FileName: LKHU3537

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky    Boring No.: 211-A-027    Sample No.: 211A027GRNSZ3
Job Number: 2855-03    Depth: 35.5-37'
Classification: **Classification Not Performed**

Permeability Tests

ASTM D5084-10

Advanced Terra Testing

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-04 |
| BORING NO. | 211-A-027 | SAMPLED | 9/18/12 KD |
| DEPTH | 38-40' | TEST STARTED | 10/12/12 CAL |
| SAMPLE NO. | 211A027PERM3 | TEST FINISHED | 10/23/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 14S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5046 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 213.6 | 209.4 |
| Wt. Wet Soil & Pan (g) | 220.3 | 216.1 |
| Wt. Dry Soil & Pan (g) | 186.4 | 186.4 |
| Wt. Lost Moisture (g) | 33.8 | 29.7 |
| Wt. of Pan Only (g) | 6.7 | 6.7 |
| Wt. of Dry Soil (g) | 179.8 | 179.8 |
| Moisture Content % | 18.8 | 16.5 |
| Wet Density PCF | 133.0 | 134.9 |
| Dry Density PCF | 111.9 | 115.8 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.611 | (cm) | 4.092 |
| Init. Area (sq in) | 2.038 | (sq cm) | 13.152 |
| Init. Height (in) | 3.002 | (cm) | 7.625 |
| Vol. Bef. Consol. (cu ft) | 0.00354 | | |
| Vol. After Consol. (cu ft) | 0.00342 | | |
| Porosity % | 30.60 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 2.962 |
| Diameter | 1.595 |
| Pressure (psi) | 1.949 |
| Area after consol. (cm*cm) | 12.883 |
| Gradient | 18.214 |
| Permeability k (cm/s) | 4.5E-09 |
| **Permeability k (m/s)** | **4.5E-11** |
| Back Pressure (psi) | 98.0 |
| Cell Pressure (psi) | 133.0 |
| Ave. Effective Stress (psi) | 34.026 |

Average temperature degree C: 22.7

Data entry by: MLM Date: 10/24/2012
Checked by: CM Date: 10/24/2012
FileName: LKP00273

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-04 |
| BORING NO. | 211-A-027 | SAMPLED | 9/18/12 KD |
| DEPTH | 38-40' | TEST STARTED | 10/12/12 CAL |
| SAMPLE NO. | 211A027PERM3 | TEST FINISHED | 10/23/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 14S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5046 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Burette Reading (CC) Open | Pore Pressure (PSI) Close | Pore Pressure (PSI) Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 1.4 | 6.3 | | | | |
| 50.0 | 48.0 | 7.8 | 8.6 | 38.5 | 47.5 | 9.0 | 0.90 |
| 60.0 | 58.0 | 9.3 | 10.0 | 48.4 | 57.3 | 8.9 | 0.89 |
| 70.0 | 68.0 | 9.9 | 10.7 | 58.7 | 67.6 | 8.9 | 0.89 |
| 80.0 | 78.0 | 11.0 | 11.7 | 69.0 | 77.8 | 8.8 | 0.88 |
| 90.0 | 88.0 | 11.9 | 12.6 | 78.9 | 88.3 | 9.4 | 0.94 |
| 100.0 | 98.0 | 12.8 | | 88.8 | 98.1 | 9.3 | 0.93 |
| 110.0 | | 14.0 | 14.1 | 98.4 | 107.9 | 9.5 | 0.95 |

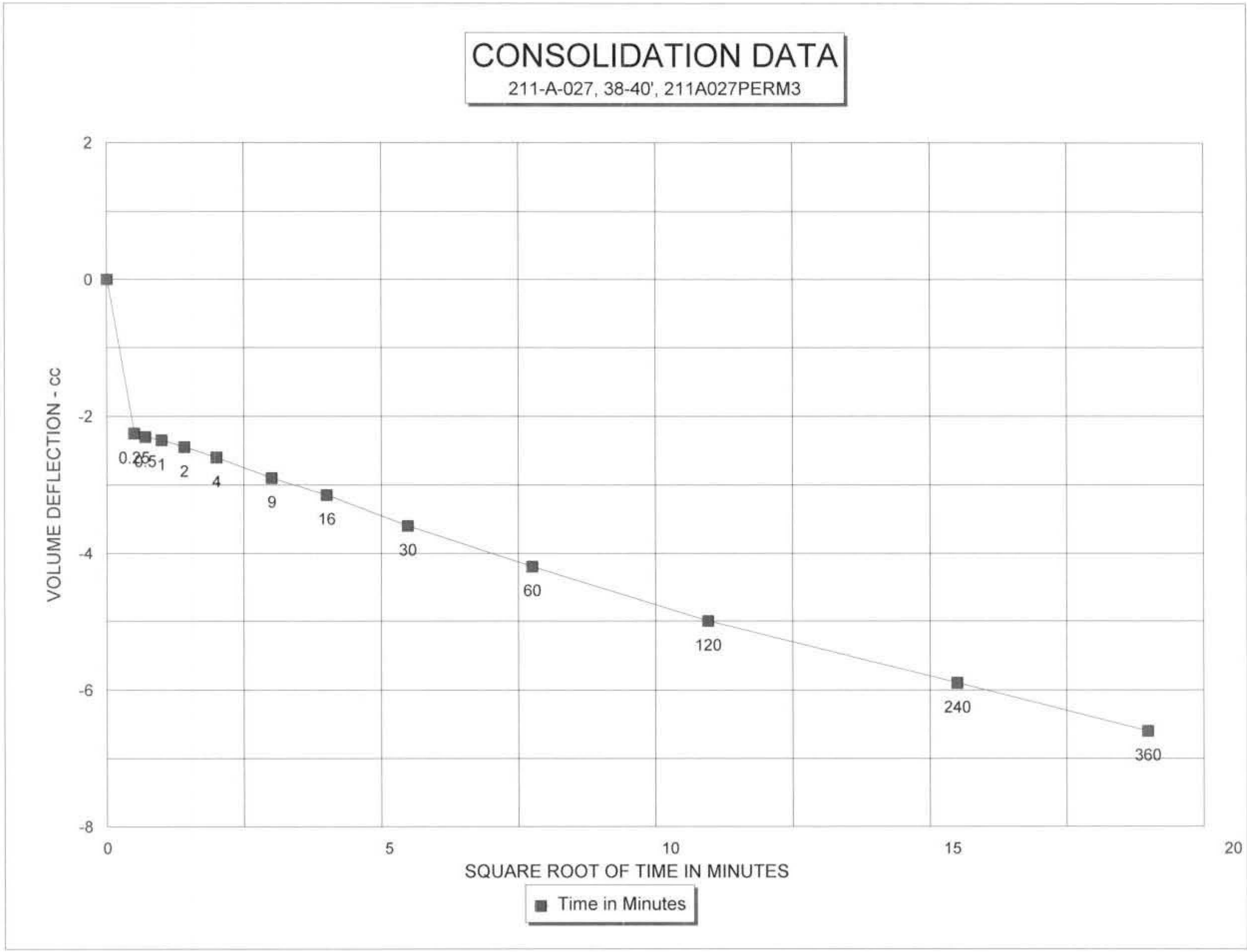
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.80 | 0.00 |
| 0.25 | 0.50 | 3.05 | -2.25 |
| 0.5 | 0.71 | 3.10 | -2.30 |
| 1 | 1.00 | 3.15 | -2.35 |
| 2 | 1.41 | 3.25 | -2.45 |
| 4 | 2.00 | 3.40 | -2.60 |
| 9 | 3.00 | 3.70 | -2.90 |
| 16 | 4.00 | 3.95 | -3.15 |
| 30 | 5.48 | 4.40 | -3.60 |
| 60 | 7.75 | 5.00 | -4.20 |
| 120 | 10.95 | 5.80 | -5.00 |
| 240 | 15.49 | 6.70 | -5.90 |
| 360 | 18.97 | 7.40 | -6.60 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.002 | Init. Vol. (CC) | 100.29 |
| Height Change (in) | 0.040 | Vol. Change (CC) | 20.90 |
| Ht. After Cons. (in) | 2.962 | Cell Exp. (CC) | 17.55 |
| Initial Area (sq in) | 2.038 | Net Change (CC) | 3.35 |
| Area After Cons. (sq in) | 1.997 | Cons. Vol. (CC) | 96.94 |

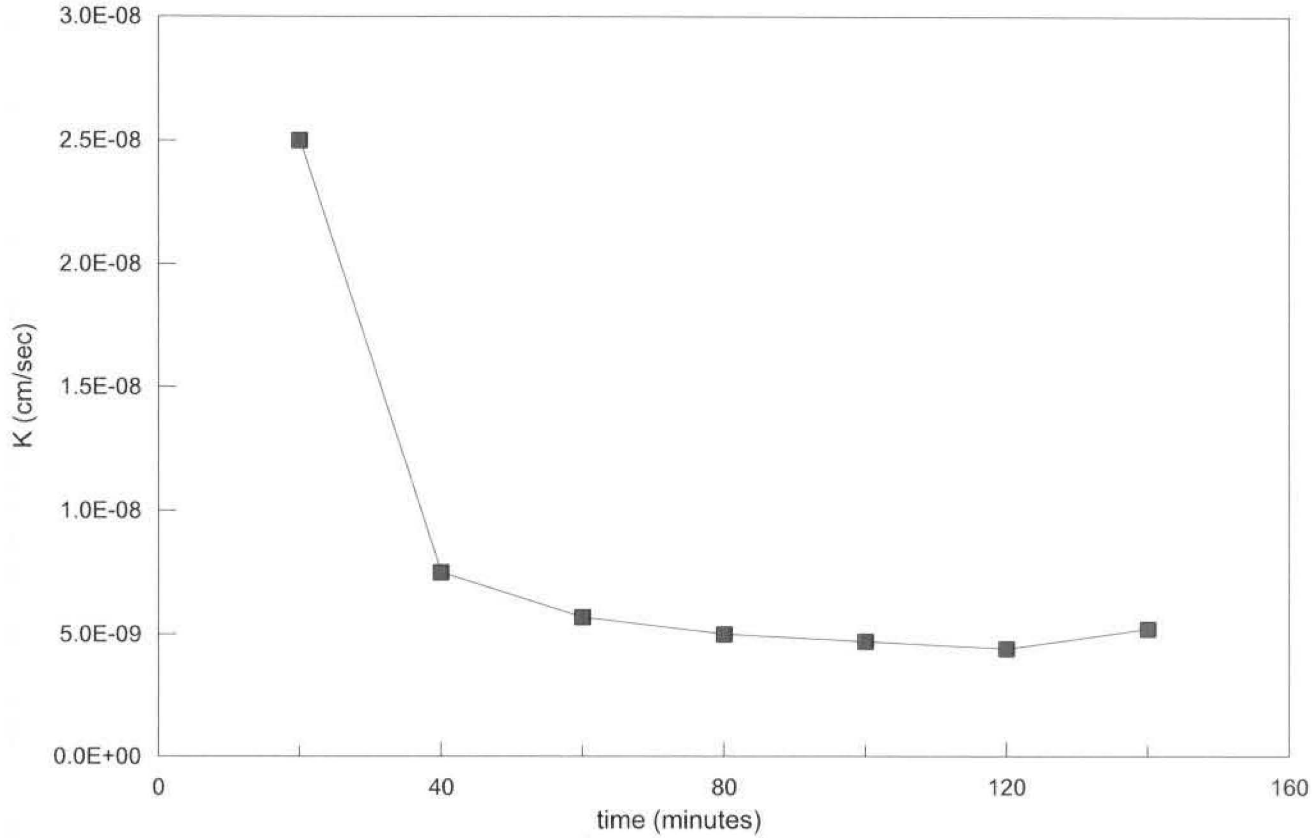
Data entry by: MLM Date: 10/24/2012
Checked by: CAL Date: 10/24/2012
FileName: LKP00273

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
211-A-027, 38-40', 211A027PERM3
VOLUME DEFLECTION - cc
2
0
-2
-4
-6
-8
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
0.25
0.5
1
2
4
9
16
30
60
120
240
360
Time in Minutes

## Preliminary Flow Pump Data

LATA-KY, SW Plume RDSI Geotechnical, 211A027PERM3

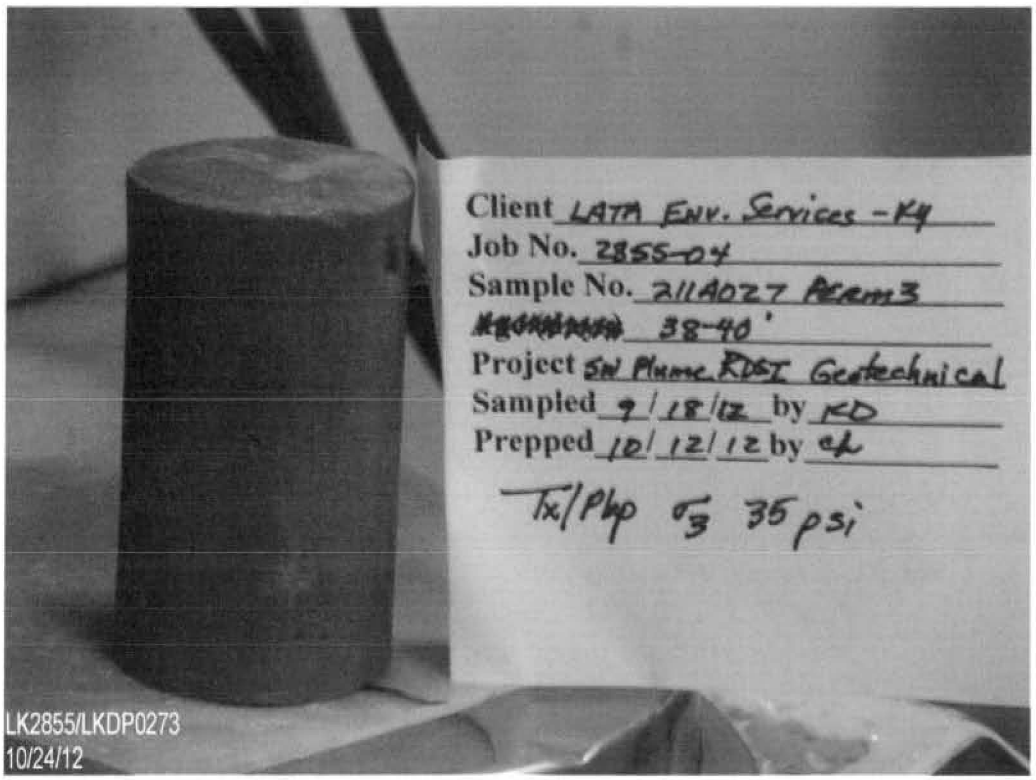



Average last 4 values
4.8E-09

Data Entered By: CAL
Data Checked By: ym
File Name: LKFP0273

Date: 10/23/2012
Date Checked 10/24/12

ADVANCED TERRA TESTING, INC.


Client LATA Env. Services - KY
Job No. 2855-04
Sample No. 211A027 Perm3
38-40'
Project SW Plume RDSI Geotechnical
Sampled 9/18/12 by KD
Prepped 10/12/12 by
Tx/Php σ3 35 psi
LK2855/LKDP0273
10/24/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-04 |
| BORING NO. | 211-A-012 | SAMPLED | 9/17/12 |
| DEPTH | 10-12' | TEST STARTED | 10/4/12 CAL |
| SAMPLE NO. | 211A012PERM1 | TEST FINISHED | 10/6/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 202.0 | 196.9 |
| Wt. Wet Soil & Pan (g) | 208.6 | 203.5 |
| Wt. Dry Soil & Pan (g) | 169.4 | 169.4 |
| Wt. Lost Moisture (g) | 39.2 | 34.1 |
| Wt. of Pan Only (g) | 6.6 | 6.6 |
| Wt. of Dry Soil (g) | 162.8 | 162.8 |
| Moisture Content % | 24.1 | 20.9 |
| Wet Density PCF | 126.0 | 132.3 |
| Dry Density PCF | 101.5 | 109.4 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.618 | (cm) | 4.110 |
| Init. Area (sq in) | 2.056 | (sq cm) | 13.266 |
| Init. Height (in) | 2.971 | (cm) | 7.546 |
| Vol. Bef. Consol. (cu ft) | 0.00354 | | |
| Vol. After Consol. (cu ft) | 0.00328 | | |
| Porosity % | 36.68 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 15 |
| Velocity CM/Sec | 9.85E-05 |
| Q (cc/s) | 3.15E-06 |
| Height | 2.950 |
| Diameter | 1.564 |
| Pressure (psi) | 2.180 |
| Area after consol. (cm*cm) | 12.399 |
| Gradient | 20.455 |
| Permeability k (cm/s) | 1.2E-08 |
| **Permeability k (m/s)** | **1.2E-10** |
| Back Pressure (psi) | 38.0 |
| Cell Pressure (psi) | 47.9 |
| Ave. Effective Stress (psi) | 8.810 |

Average temperature degree C: 21.8

Data entry by: MLM Date: 10/08/2012
Checked by: GAC Date: 10/08/12
FileName: LKP0A121

## TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-04 |
| BORING NO. | 211-A-012 | SAMPLED | 9/17/12 |
| DEPTH | 10-12' | TEST STARTED | 10/4/12 CAL |
| SAMPLE NO. | 211A012PERM1 | TEST FINISHED | 10/6/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

### SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Burette Reading (CC) Open | Pore Pressure (PSI) Close | Pore Pressure (PSI) Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 1.8 | 7.2 | | | | |
| 50.0 | | 12.0 | 12.2 | 39.0 | 48.5 | 9.5 | 0.95 |

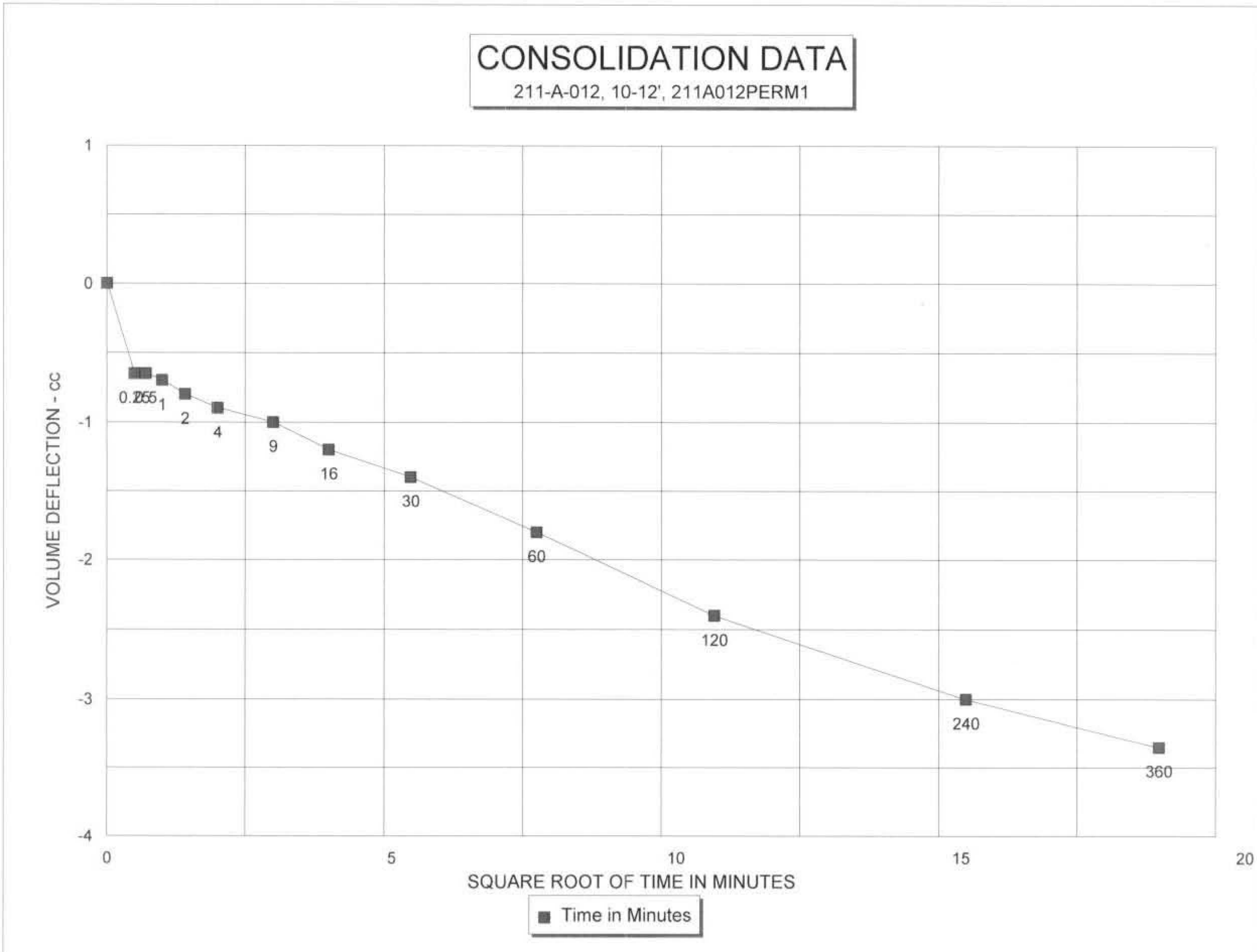
### CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 12.20 | 0.00 |
| 0.25 | 0.50 | 12.85 | -0.65 |
| 0.5 | 0.71 | 12.85 | -0.65 |
| 1 | 1.00 | 12.90 | -0.70 |
| 2 | 1.41 | 13.00 | -0.80 |
| 4 | 2.00 | 13.10 | -0.90 |
| 9 | 3.00 | 13.20 | -1.00 |
| 16 | 4.00 | 13.40 | -1.20 |
| 30 | 5.48 | 13.60 | -1.40 |
| 60 | 7.75 | 14.00 | -1.80 |
| 120 | 10.95 | 14.60 | -2.40 |
| 240 | 15.49 | 15.20 | -3.00 |
| 360 | 18.97 | 15.55 | -3.35 |

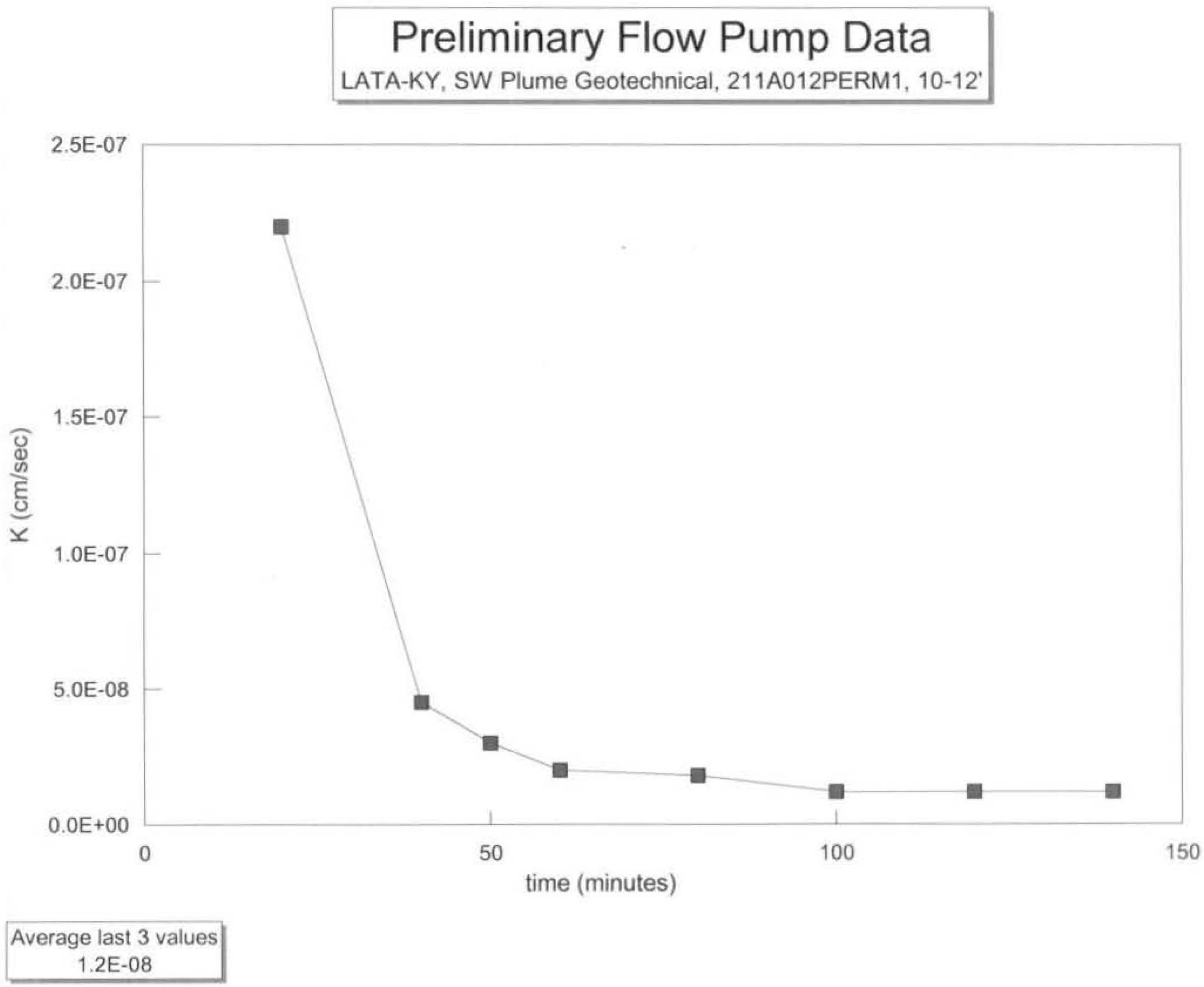
| | | | |
|---|---|---|---|
| Initial Height (in) | 2.971 | Init. Vol. (CC) | 100.12 |
| Height Change (in) | 0.021 | Vol. Change (CC) | 14.80 |
| Ht. After Cons. (in) | 2.950 | Cell Exp. (CC) | 7.60 |
| Initial Area (sq in) | 2.056 | Net Change (CC) | 7.20 |
| Area After Cons. (sq in) | 1.922 | Cons. Vol. (CC) | 92.92 |

Data entry by: MLM Date: 10/08/2012
Checked by: CK Date: 10/11/12
FileName: LKP0A121

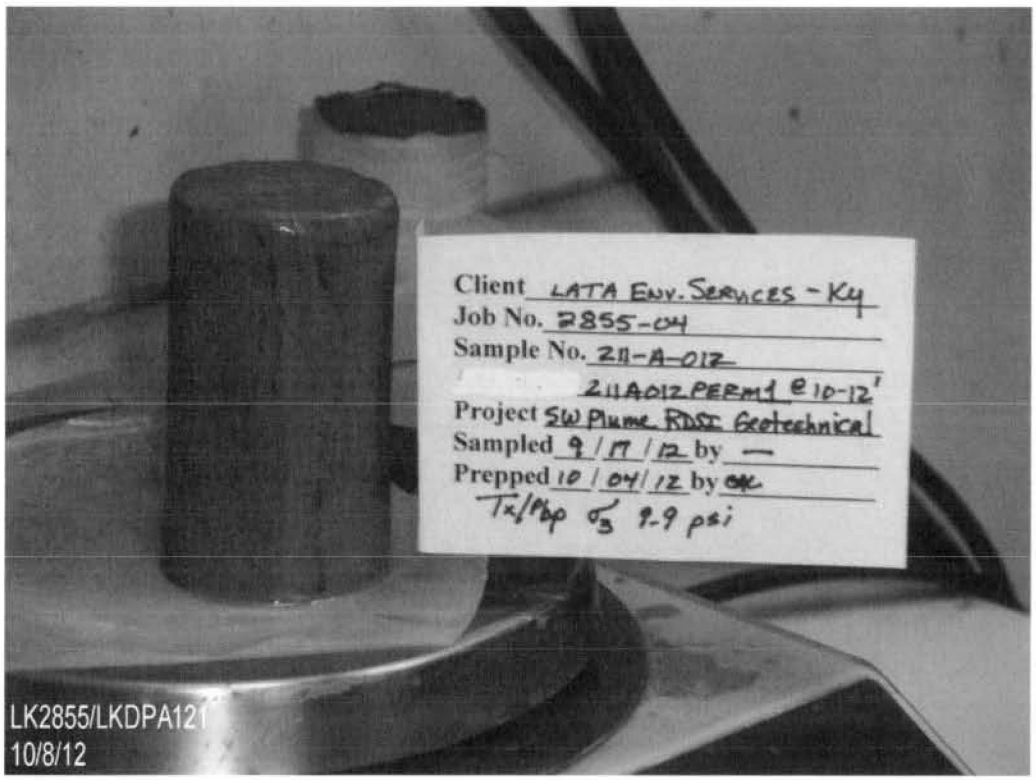
ADVANCED TERRA TESTING, INC. ATT

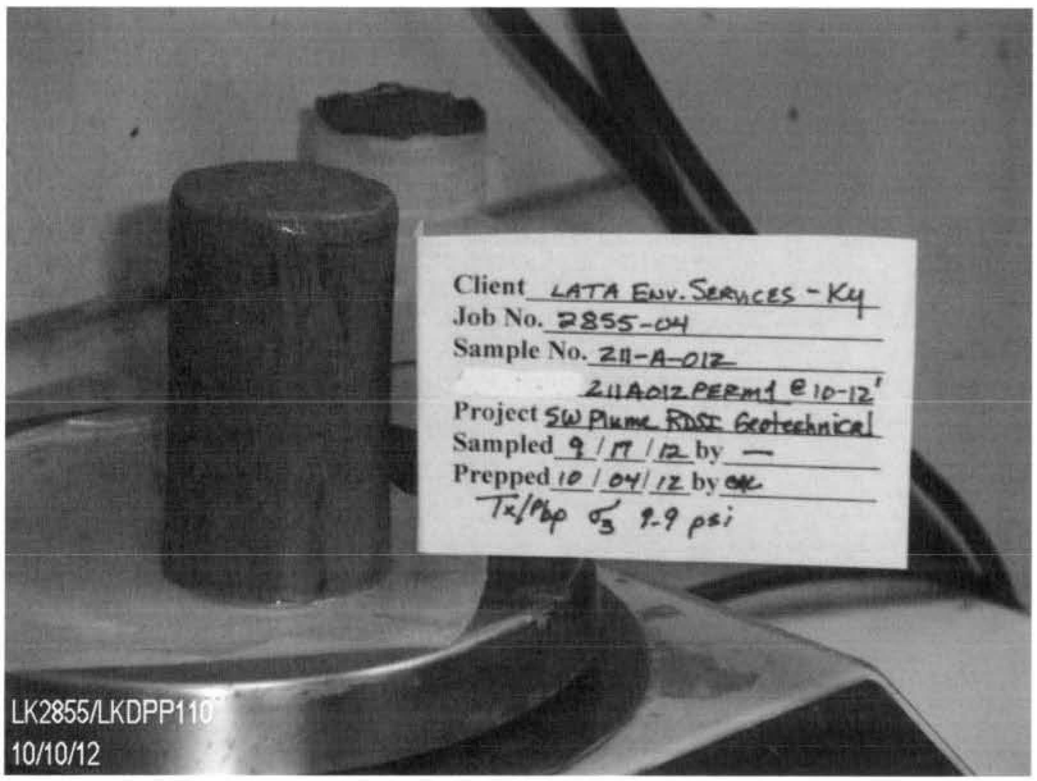


CONSOLIDATION DATA
211-A-012, 10-12', 211A012PERM1
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
1
0
-1
-2
-3
-4
0
5
10
15
20
0.25
1
2
4
9
16
30
60
120
240
360
Time in Minutes




| | | | |
|---|---|---|---|
| Data Entered By: | CAL | Date: | 10/06/2012 |
| Data Checked By: | ym | Date Checked | 10/12/12 |
| File Name: | LKFPA121 | | |


Client LATA Env. Services - Ky
Job No. 2855-04
Sample No. 211-A-012
211A012PERM1 @ 10-12'
Project SW Plume RDSI Geotechnical
Sampled 9 / 17 / 12 by —
Prepped 10 / 04 / 12 by
Tx/Pbp σ3 9.9 psi
LK2855/LKDPA121
10/8/12


Client LATA ENV. SERVICES - KY
Job No. 2855-04
Sample No. 211-A-012
211A012PERM1 @ 10-12'
Project SW Plume RDSI Geotechnical
Sampled 9 / 17 / 12 by —
Prepped 10 / 04 / 12 by CK
Tx/Pbp σ3 9.9 psi
LK2855/LKDPP110
10/10/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Service-Ky | JOB NO. | 2855-04 |
| BORING NO. | 211-A-012 | SAMPLED | 9/17/12 |
| DEPTH | 23-25' | TEST STARTED | 10/04/12 CAL |
| SAMPLE NO. | 211A012PERM2 | TEST FINISHED | 10/09/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 3105 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 214.8 | 215.8 |
| Wt. Wet Soil & Pan (g) | 223.0 | 223.9 |
| Wt. Dry Soil & Pan (g) | 197.5 | 197.5 |
| Wt. Lost Moisture (g) | 25.4 | 26.4 |
| Wt. of Pan Only (g) | 8.1 | 8.1 |
| Wt. of Dry Soil (g) | 189.4 | 189.4 |
| Moisture Content % | 13.4 | 13.9 |
| Wet Density PCF | 134.5 | 143.3 |
| Dry Density PCF | 118.6 | 125.8 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.613 | (cm) | 4.097 |
| Init. Area (sq in) | 2.043 | (sq cm) | 13.184 |
| Init. Height (in) | 2.977 | (cm) | 7.562 |
| Vol. Bef. Consol. (cu ft) | 0.00352 | | |
| Vol. After Consol. (cu ft) | 0.00332 | | |
| Porosity % | 28.07 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 2.920 |
| Diameter | 1.582 |
| Pressure (psi) | 2.510 |
| Area after consol. (cm*cm) | 12.674 |
| Gradient | 23.794 |
| Permeability k (cm/s) | 3.5E-09 |
| **Permeability k (m/s)** | **3.5E-11** |
| Back Pressure (psi) | 48.0 |
| Cell Pressure (psi) | 69.6 |
| Ave. Effective Stress (psi) | 20.345 |

Average temperature degree C: 22.4

Notes: Sample diameter is less than specification for nominal particle size in sample.

Data entry by: MLM Date: 10/10/2012

Checked by: CH Date: 10/12/2012

FileName: LKP0A122

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| CLIENT | LATA Environmental Service-Ky | JOB NO. | 2855-04 |
|---|---|---|---|
| BORING NO. | 211-A-012 | SAMPLED | 9/17/12 |
| DEPTH | 23-25' | TEST STARTED | 10/04/12 CAL |
| SAMPLE NO. | 211A012PERM2 | TEST FINISHED | 10/09/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 3105 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Burette Reading (CC) Open | Pore Pressure (PSI) Close | Pore Pressure (PSI) Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 1.8 | 7.3 | | | | |
| 50.0 | 48.0 | 9.5 | 10.4 | 39.2 | 48.5 | 9.3 | 0.93 |
| 60.0 | | 11.4 | 11.8 | 49.0 | 58.7 | 9.7 | 0.97 |

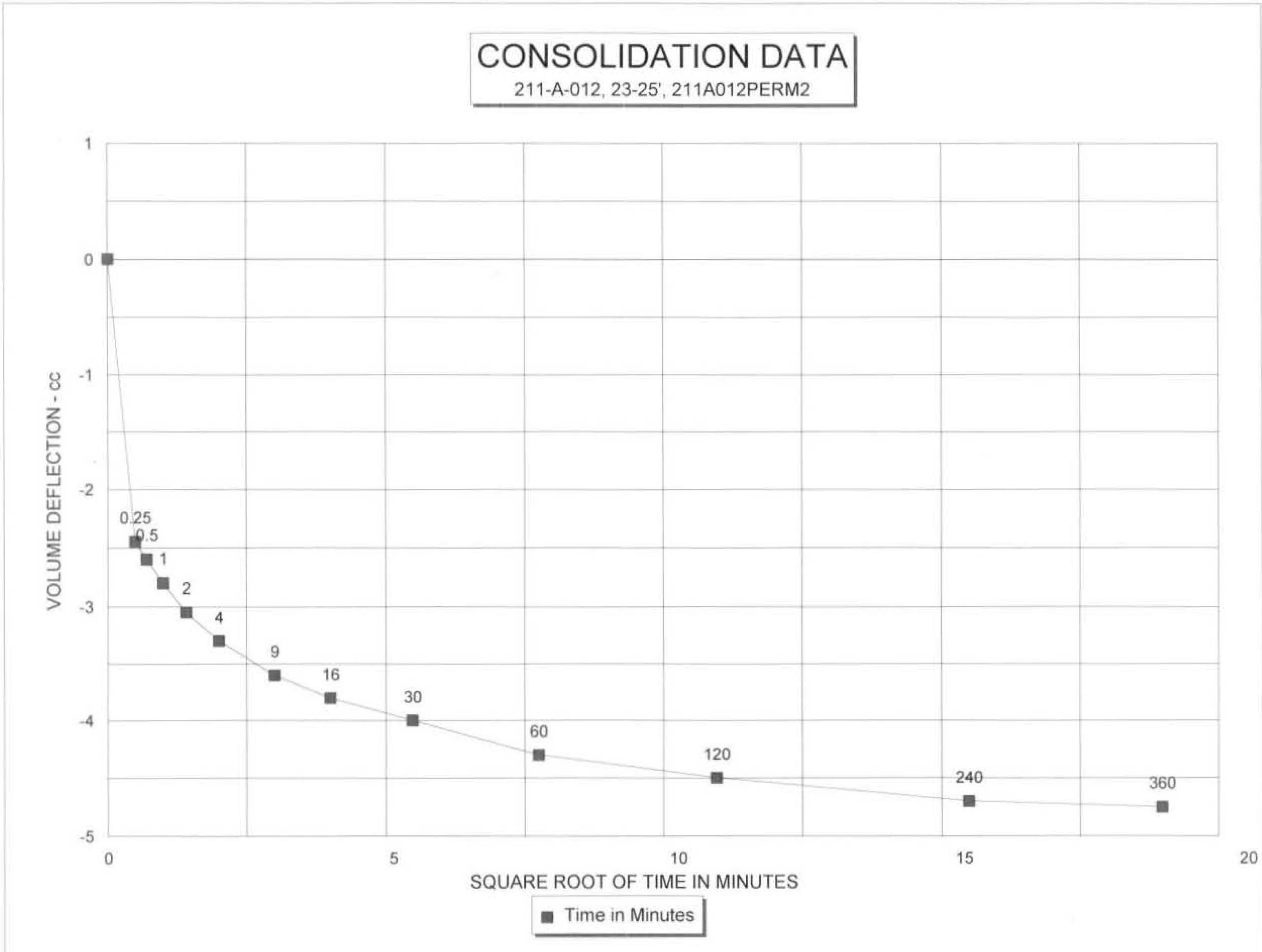
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 11.80 | 0.00 |
| 0.25 | 0.50 | 14.25 | -2.45 |
| 0.5 | 0.71 | 14.40 | -2.60 |
| 1 | 1.00 | 14.60 | -2.80 |
| 2 | 1.41 | 14.85 | -3.05 |
| 4 | 2.00 | 15.10 | -3.30 |
| 9 | 3.00 | 15.40 | -3.60 |
| 16 | 4.00 | 15.60 | -3.80 |
| 30 | 5.48 | 15.80 | -4.00 |
| 60 | 7.75 | 16.10 | -4.30 |
| 120 | 10.95 | 16.30 | -4.50 |
| 240 | 15.49 | 16.50 | -4.70 |
| 360 | 18.97 | 16.55 | -4.75 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 2.977 | Init. Vol. (CC) | 99.70 |
| Height Change (in) | 0.057 | Vol. Change (CC) | 15.20 |
| Ht. After Cons. (in) | 2.920 | Cell Exp. (CC) | 9.51 |
| Initial Area (sq in) | 2.043 | Net Change (CC) | 5.69 |
| Area After Cons. (sq in) | 1.964 | Cons. Vol. (CC) | 94.02 |

Data entry by: MLM Date: 10/10/2012
Checked by: CAL Date: 10/12/2012
FileName: LKP0A122

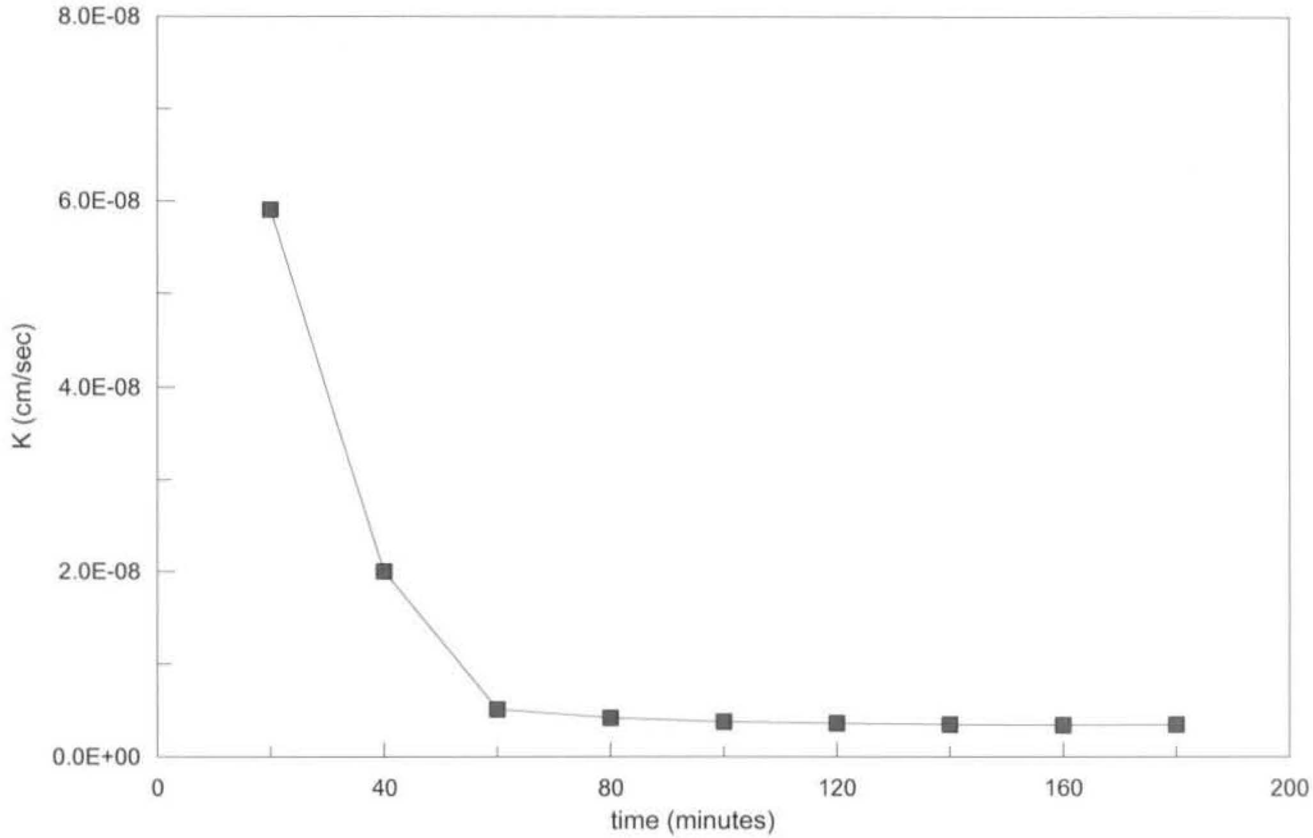
ADVANCED TERRA TESTING, INC.
ATT



CONSOLIDATION DATA
211-A-012, 23-25', 211A012PERM2
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
0.25
0.5
1
2
4
9
16
30
60
120
240
360

# Preliminary Flow Pump Data

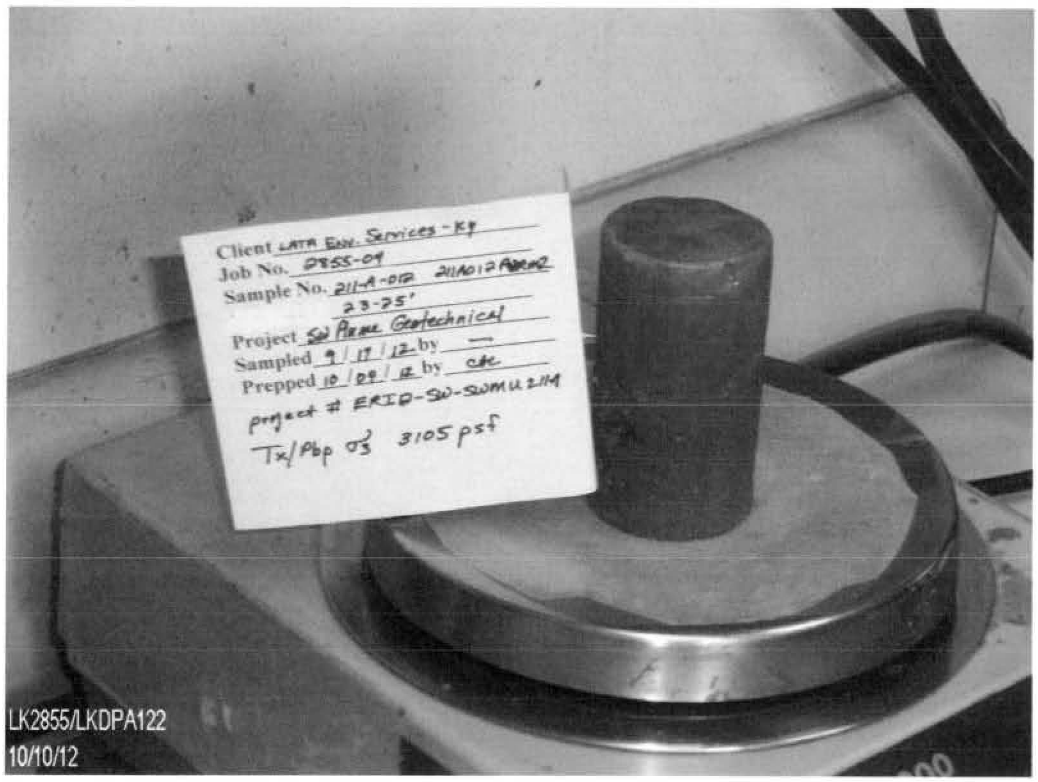
LATA-KY, SW Plume Geotechnical, 211A012PERM2, 23-25'




Average last 3 values
3.5E-09

Data Entered By: CAL
Data Checked By: ym
File Name: LKFPA122

Date: 10/09/2012
Date Checked 10/10/12


Client LATA Env. Services - KY
Job No. 2855-09
Sample No. 211-A-012 211A012AB
23-25'
Project SW Plume Geotechnical
Sampled 9 / 19 / 12 by
Prepped 10 / 09 / 12 by cde
project # ERID-SW-SWMU 211A
Tx/Pbp σ3 3105 psf
LK2855/LKDPA122
10/10/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT LATA Environmenetal Services -KY — JOB NO. 2855-04

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 |
| DEPTH | 38-40' | TEST STARTED | 10/06/12 CAL |
| SAMPLE NO. | 211A012PERM3 | TEST FINISHED | 10/16/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5046 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 197.8 | 194.4 |
| Wt. Wet Soil & Pan (g) | 206.1 | 202.7 |
| Wt. Dry Soil & Pan (g) | 164.4 | 164.4 |
| Wt. Lost Moisture (g) | 41.8 | 38.3 |
| Wt. of Pan Only (g) | 8.3 | 8.3 |
| Wt. of Dry Soil (g) | 156.0 | 156.0 |
| Moisture Content % | 26.8 | 24.6 |
| Wet Density PCF | 123.0 | 124.1 |
| Dry Density PCF | 97.0 | 99.6 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.620 | (cm) | 4.115 |
| Init. Area (sq in) | 2.061 | (sq cm) | 13.299 |
| Init. Height (in) | 2.972 | (cm) | 7.549 |
| Vol. Bef. Consol. (cu ft) | 0.00355 | | |
| Vol. After Consol. (cu ft) | 0.00345 | | |
| Porosity % | 39.21 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 19 |
| Velocity CM/Sec | 1.25E-04 |
| Q (cc/s) | 3.99E-06 |
| Height | 2.868 |
| Diameter | 1.627 |
| Pressure (psi) | 4.100 |
| Area after consol. (cm*cm) | 13.421 |
| Gradient | 39.571 |
| Permeability k (cm/s) | 7.5E-09 |
| **Permeability k (m/s)** | **7.5E-11** |
| Back Pressure (psi) | 108.0 |
| Cell Pressure (psi) | 143.0 |
| Ave. Effective Stress (psi) | 32.950 |

Average temperature degree C: 22.7

Data entry by: DAW Date: 10/18/2012
Checked by: cdk Date: 10/18/12
FileName: LKP00123

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmenetal Services -KY | JOB NO. | 2855-04 |
| BORING NO. | 211-A-012 | SAMPLED | 09/17/12 |
| DEPTH | 38-40' | TEST STARTED | 10/06/12 CAL |
| SAMPLE NO. | 211A012PERM3 | TEST FINISHED | 10/16/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5046 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 1.1 | 6.5 | | | | |
| 50.0 | 48.0 | 7.4 | 8.2 | 39.0 | 47.3 | 8.3 | 0.83 |
| 60.0 | 58.0 | 8.0 | 8.7 | 49.0 | 57.9 | 8.9 | 0.89 |
| 70.0 | 68.0 | 8.9 | 9.6 | 58.9 | 67.3 | 8.4 | 0.84 |
| 80.0 | 78.0 | 9.7 | 10.4 | 68.9 | 77.7 | 8.8 | 0.88 |
| 90.0 | 88.0 | 10.7 | 11.4 | 79.0 | 88.0 | 9.0 | 0.90 |
| 100.0 | 98.0 | 11.5 | 12.1 | 88.9 | 98.1 | 9.2 | 0.92 |
| 110.0 | 108.0 | 12.5 | - | 98.8 | 108.0 | 9.2 | 0.92 |
| 120.0 | | 13.1 | 13.1 | 108.4 | 117.9 | 9.5 | 0.95 |

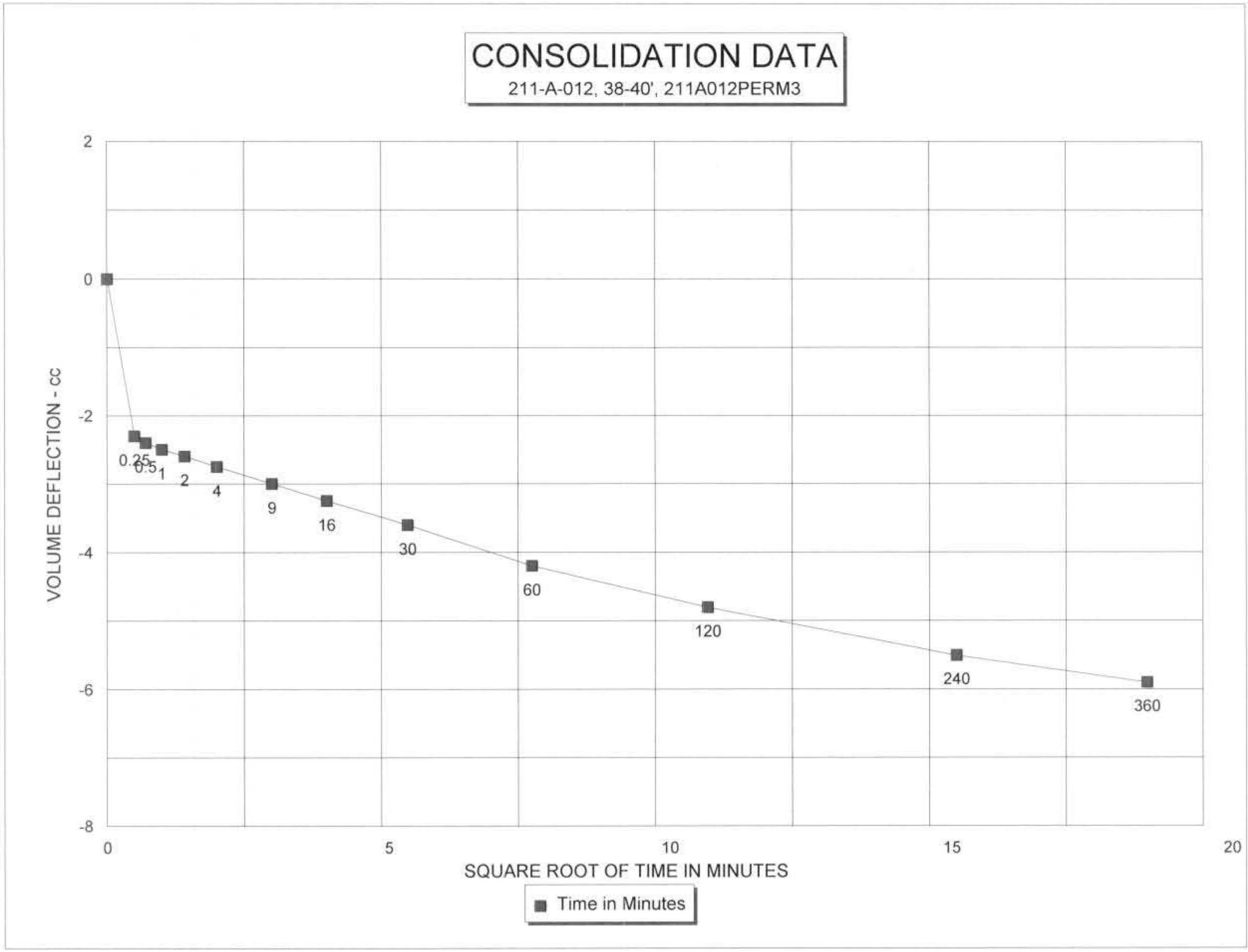
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.30 | 0.00 |
| 0.25 | 0.50 | 2.60 | -2.30 |
| 0.5 | 0.71 | 2.70 | -2.40 |
| 1 | 1.00 | 2.80 | -2.50 |
| 2 | 1.41 | 2.90 | -2.60 |
| 4 | 2.00 | 3.05 | -2.75 |
| 9 | 3.00 | 3.30 | -3.00 |
| 16 | 4.00 | 3.55 | -3.25 |
| 30 | 5.48 | 3.90 | -3.60 |
| 60 | 7.75 | 4.50 | -4.20 |
| 120 | 10.95 | 5.10 | -4.80 |
| 240 | 15.49 | 5.80 | -5.50 |
| 360 | 18.97 | 6.20 | -5.90 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 2.972 | Init. Vol. (CC) | 100.40 |
| Height Change (in) | 0.104 | Vol. Change (CC) | 18.80 |
| Ht. After Cons. (in) | 2.868 | Cell Exp. (CC) | 16.19 |
| Initial Area (sq in) | 2.061 | Net Change (CC) | 2.61 |
| Area After Cons. (sq in) | 2.080 | Cons. Vol. (CC) | 97.79 |

Data entry by: DAW Date: 10/18/2012
Checked by: OAC Date: 10/18/12
FileName: LKP00123

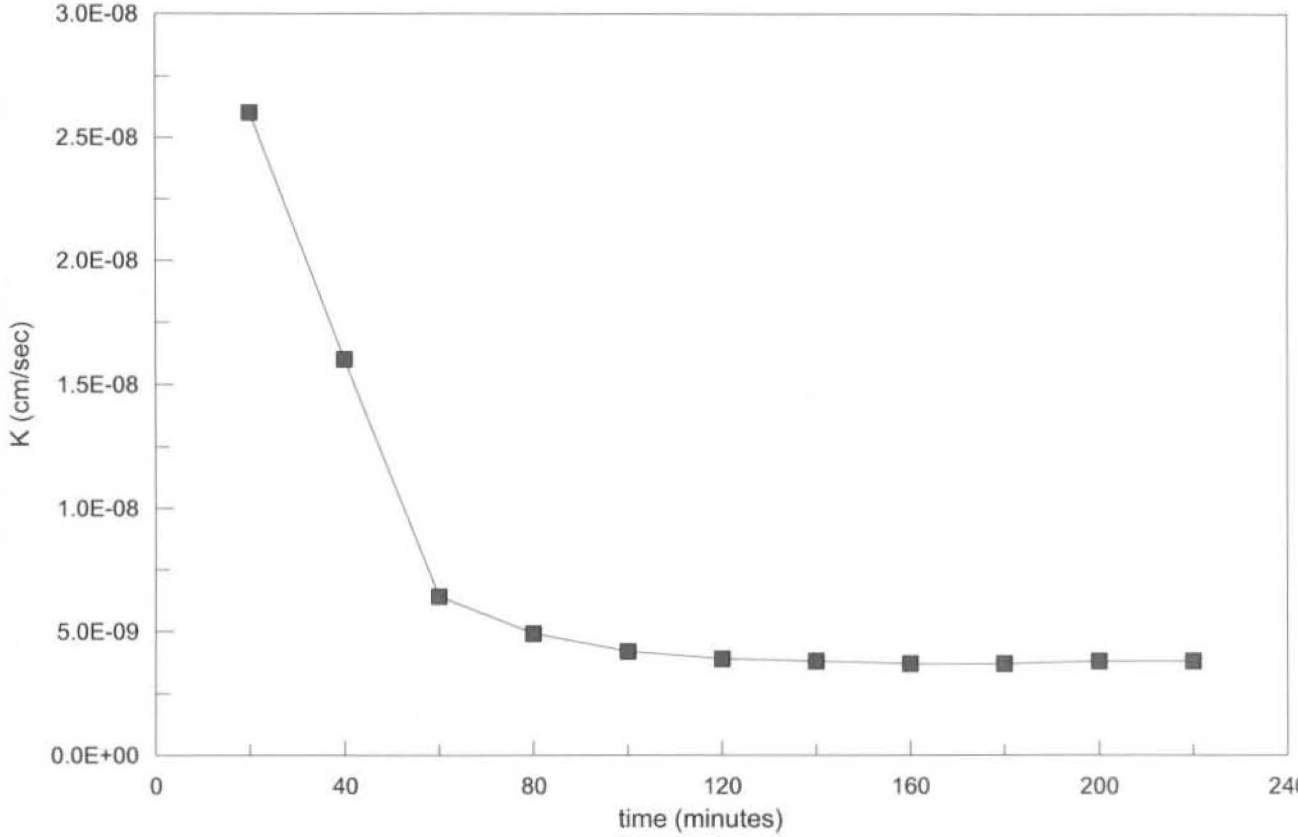
ADVANCED TERRA TESTING, INC. ATT



CONSOLIDATION DATA
211-A-012, 38-40', 211A012PERM3
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
0.25
0.5
1
2
4
9
16
30
60
120
240
360

# Preliminary Flow Pump Data

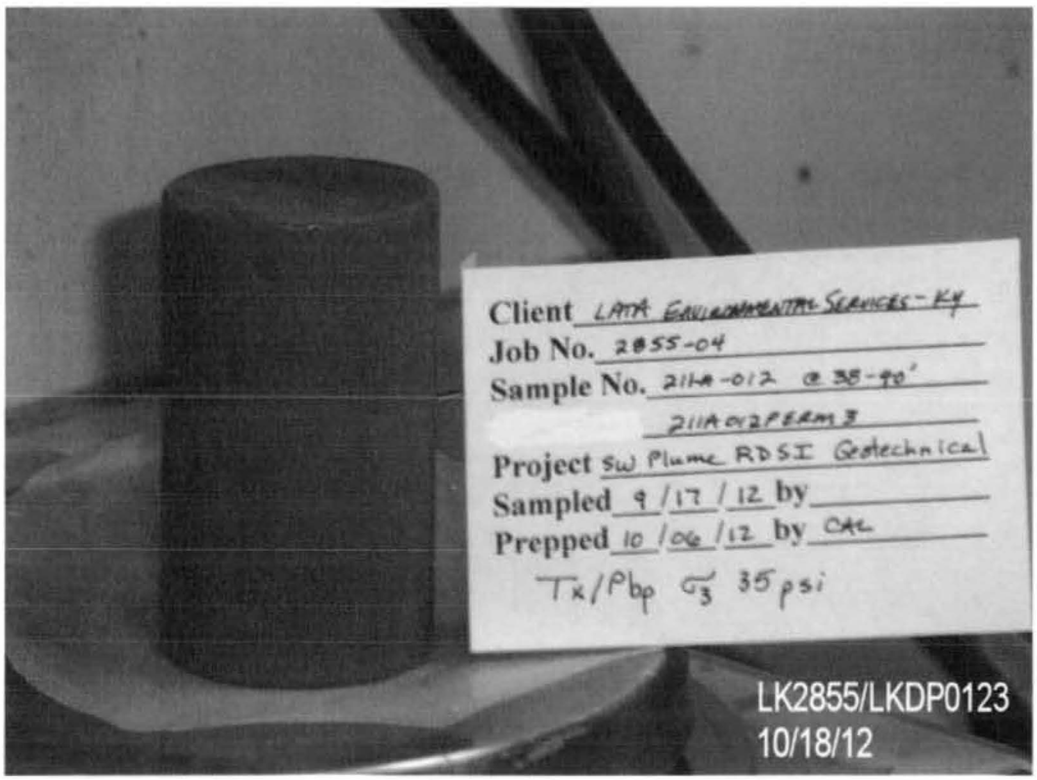
LATA-KY, 211-A-012 PERM3, 38-40'




Average last 4 values
3.8E-09

Data Entered By: CAL
Data Checked By: DAW
File Name: LKFP0123

Date: 10/17/2012
Date Checked 10/18/12


Client LATA ENVIRONMENTAL SERVICES - KY
Job No. 2855-04
Sample No. 211A-012 @ 38-40'
211A012PERM3
Project SW Plume RDSI Geotechnical
Sampled 9 / 17 / 12 by
Prepped 10 / 06 / 12 by CAL
Tx/Pbp σ3 35psi
LK2855/LKDP0123
10/18/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT LATA Environmental Services - KY

JOB NO. 2855-04

| | | | |
|---|---|---|---|
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 |
| DEPTH | 10-12' | TEST STARTED | 10/04/12 CAL |
| SAMPLE NO. | 211A027PERM1 | TEST FINISHED | 10/11/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 14S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 192.6 | 189.8 |
| Wt. Wet Soil & Pan (g) | 200.8 | 198.0 |
| Wt. Dry Soil & Pan (g) | 165.3 | 165.3 |
| Wt. Lost Moisture (g) | 35.5 | 32.7 |
| Wt. of Pan Only (g) | 8.2 | 8.2 |
| Wt. of Dry Soil (g) | 157.1 | 157.1 |
| Moisture Content % | 22.6 | 20.8 |
| Wet Density PCF | 127.7 | 128.1 |
| Dry Density PCF | 104.2 | 106.0 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.564 | (cm) | 3.973 |
| Init. Area (sq in) | 1.921 | (sq cm) | 12.395 |
| Init. Height (in) | 2.991 | (cm) | 7.597 |
| Vol. Bef. Consol. (cu ft) | 0.00333 | | |
| Vol. After Consol. (cu ft) | 0.00327 | | |
| Porosity % | 35.31 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 15 |
| Velocity CM/Sec | 9.85E-05 |
| Q (cc/s) | 3.15E-06 |
| Height | 2.956 |
| Diameter | 1.559 |
| Pressure (psi) | 1.403 |
| Area after consol. (cm*cm) | 12.321 |
| Gradient | 13.138 |
| Permeability k (cm/s) | 1.9E-08 |
| **Permeability k (m/s)** | **1.9E-10** |
| Back Pressure (psi) | 68.0 |
| Cell Pressure (psi) | 77.9 |
| Ave. Effective Stress (psi) | 9.199 |

Average temperature degree C: 22.3

Data entry by: DAW Date: 10/12/2012
Checked by: CAL Date: 10-12-12
FileName: LKP00271

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-04 |
| BORING NO. | 211-A-027 | SAMPLED | 09/18/12 |
| DEPTH | 10-12' | TEST STARTED | 10/04/12 CAL |
| SAMPLE NO. | 211A027PERM1 | TEST FINISHED | 10/11/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 14S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 2.2 | 8.1 | | | | |
| 50.0 | 48.0 | 10.6 | 11.4 | 38.8 | 46.8 | 8.0 | 0.80 |
| 60.0 | 58.0 | 11.7 | 12.5 | 48.9 | 57.8 | 8.9 | 0.89 |
| 70.0 | 68.0 | 12.4 | 13.1 | 58.7 | 68.1 | 9.4 | 0.94 |
| 80.0 | | 13.5 | 13.8 | 68.6 | 78.1 | 9.5 | 0.95 |

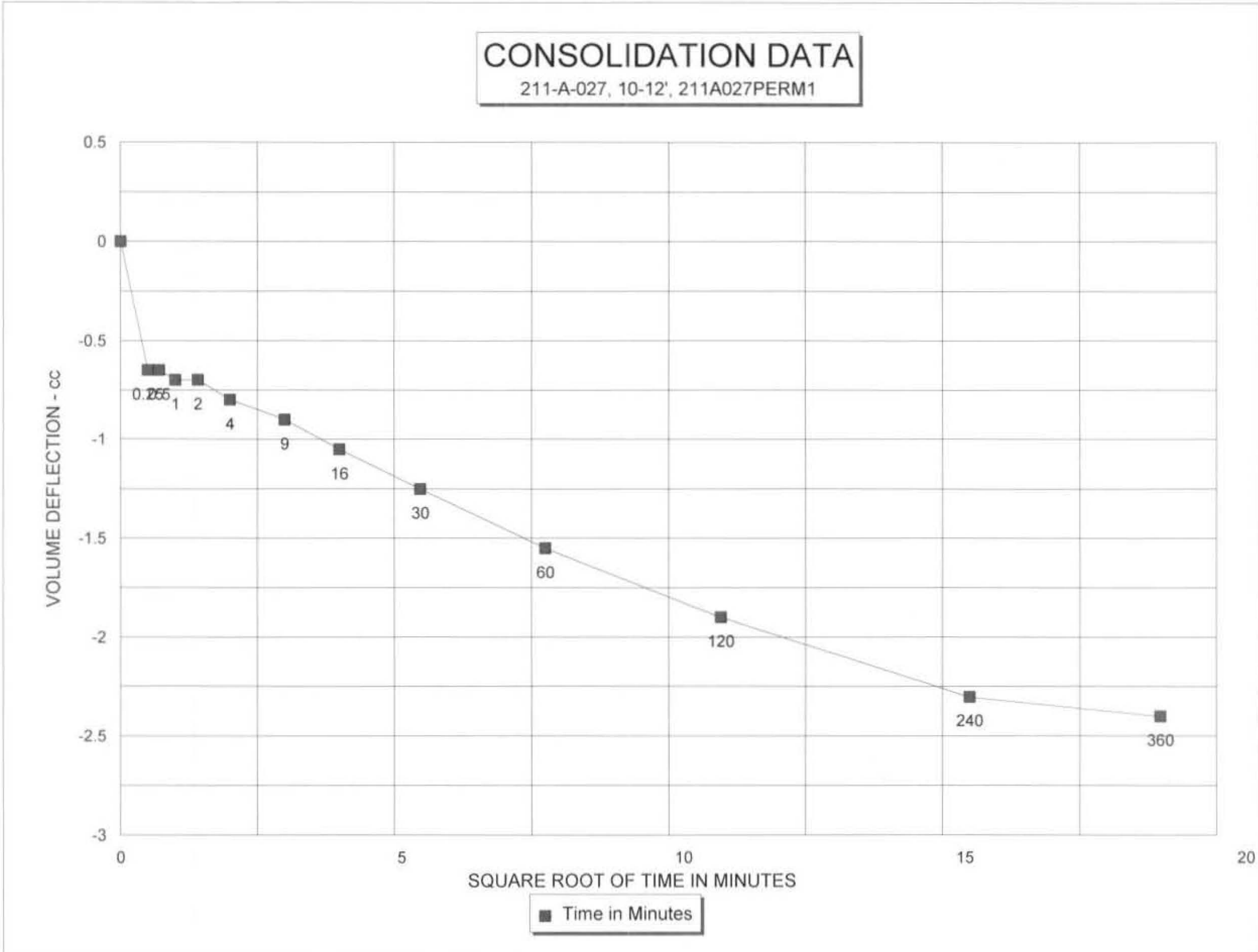
CONSOLIDATION DATA

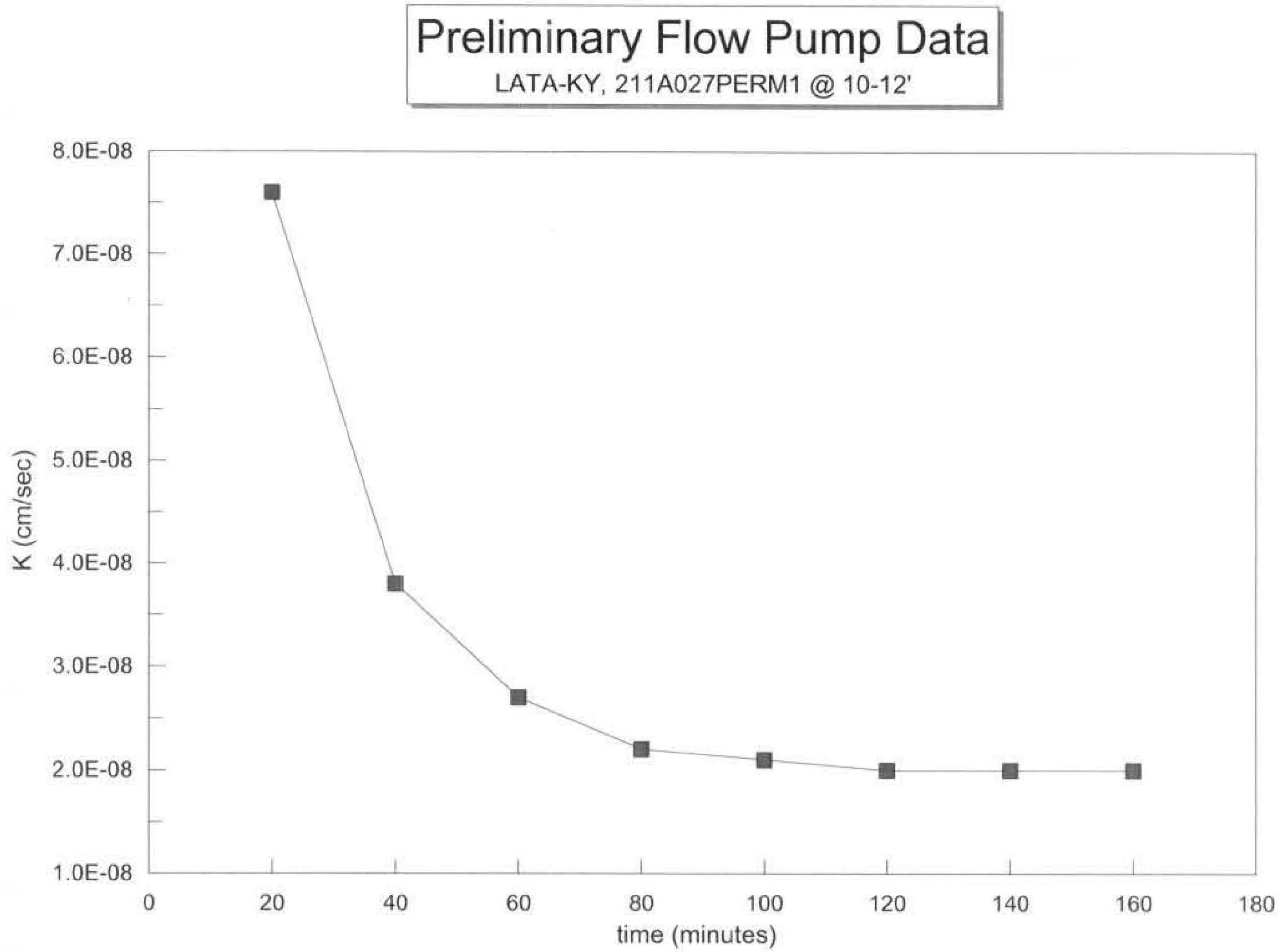
| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.20 | 0.00 |
| 0.25 | 0.50 | 0.85 | -0.65 |
| 0.5 | 0.71 | 0.85 | -0.65 |
| 1 | 1.00 | 0.90 | -0.70 |
| 2 | 1.41 | 0.90 | -0.70 |
| 4 | 2.00 | 1.00 | -0.80 |
| 9 | 3.00 | 1.10 | -0.90 |
| 16 | 4.00 | 1.25 | -1.05 |
| 30 | 5.48 | 1.45 | -1.25 |
| 60 | 7.75 | 1.75 | -1.55 |
| 120 | 10.95 | 2.10 | -1.90 |
| 240 | 15.49 | 2.50 | -2.30 |
| 360 | 18.97 | 2.60 | -2.40 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 2.991 | Init. Vol. (CC) | 94.18 |
| Height Change (in) | 0.035 | Vol. Change (CC) | 14.40 |
| Ht. After Cons. (in) | 2.956 | Cell Exp. (CC) | 12.75 |
| Initial Area (sq in) | 1.921 | Net Change (CC) | 1.65 |
| Area After Cons. (sq in) | 1.910 | Cons. Vol. (CC) | 92.53 |

Data entry by: DAW Date: 10/12/2012
Checked by: ajc Date: 10-12-12
FileName: LKP00271

ADVANCED TERRA TESTING, INC.
ATT

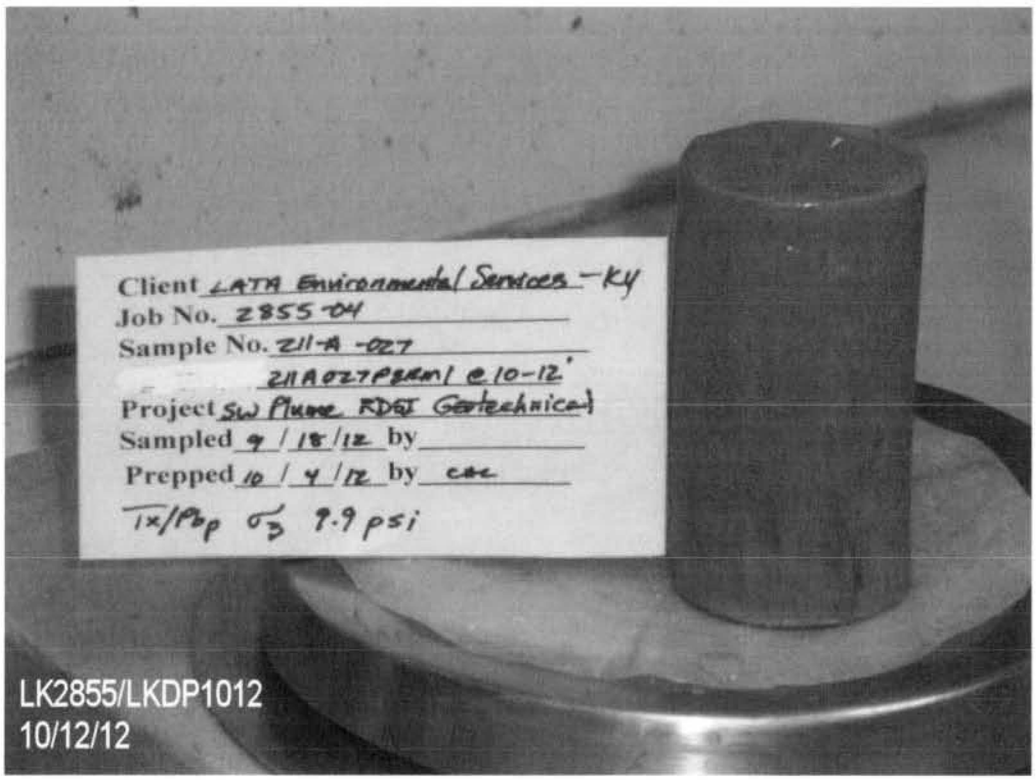

CONSOLIDATION DATA
211-A-027, 10-12', 211A027PERM1
VOLUME DEFLECTION - cc
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
1
2
4
9
16
30
60
120
240
360
Time in Minutes




Average last 4 values
2.0E-08

Data Entered By: CAL
Data Checked By: DAW
File Name: LKFP0271

Date: 10-11-2012
Date Checked 10/12/12


Client LATA Environmental Services - KY
Job No. 2855-04
Sample No. 211-A -027
211A027PERM1 @ 10-12'
Project SW Plume RDSI Geotechnical
Sampled 9 / 18 / 12 by
Prepped 10 / 4 / 12 by cac
Tx/Pbp σ3 9.9 psi
LK2855/LKDP1012
10/12/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-04 |
| BORING NO. | 211-A-027 | SAMPLED | |
| DEPTH | 22.5-24.5' | TEST STARTED | 10/10/12 CAL |
| SAMPLE NO. | 211A027PERM2 | TEST FINISHED | 10/15/12 DPM |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 2911 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 249.3 | 252.1 |
| Wt. Wet Soil & Pan (g) | 255.9 | 258.7 |
| Wt. Dry Soil & Pan (g) | 228.6 | 228.6 |
| Wt. Lost Moisture (g) | 27.3 | 30.1 |
| Wt. of Pan Only (g) | 6.6 | 6.6 |
| Wt. of Dry Soil (g) | 222.0 | 222.0 |
| Moisture Content % | 12.3 | 13.6 |
| Wet Density PCF | 136.1 | 139.8 |
| Dry Density PCF | 121.2 | 123.1 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.663 | (cm) | 4.224 |
| Init. Area (sq in) | 2.172 | (sq cm) | 14.014 |
| Init. Height (in) | 3.212 | (cm) | 8.158 |
| Vol. Bef. Consol. (cu ft) | 0.00404 | | |
| Vol. After Consol. (cu ft) | 0.00397 | | |
| Porosity % | 26.75 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 3.181 |
| Diameter | 1.658 |
| Pressure (psi) | 2.260 |
| Area after consol. (cm*cm) | 13.929 |
| Gradient | 19.666 |
| Permeability k (cm/s) | 3.8E-09 |
| **Permeability k (m/s)** | **3.8E-11** |
| Back Pressure (psi) | 58.0 |
| Cell Pressure (psi) | 78.2 |
| Ave. Effective Stress (psi) | 19.070 |

Average temperature degree C: 22.4

Data entry by: DAW Date: 10/16/2012
Checked by: CK Date: 10/16/12
FileName: LKP027P2

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-04 |
| BORING NO. | 211-A-027 | SAMPLED | |
| DEPTH | 22.5-24.5' | TEST STARTED | 10/10/12 CAL |
| SAMPLE NO. | 211A027PERM2 | TEST FINISHED | 10/15/12 DPM |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 2911 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 1.7 | 7.7 | | | | |
| 50.0 | 48.0 | 7.7 | 8.7 | 39.1 | 47.6 | 8.5 | 0.85 |
| 60.0 | 58.0 | 8.9 | 9.7 | 49.2 | 58.2 | 9.0 | 0.90 |
| 70.0 | | 9.8 | 10.0 | 59.1 | 68.6 | 9.5 | 0.95 |

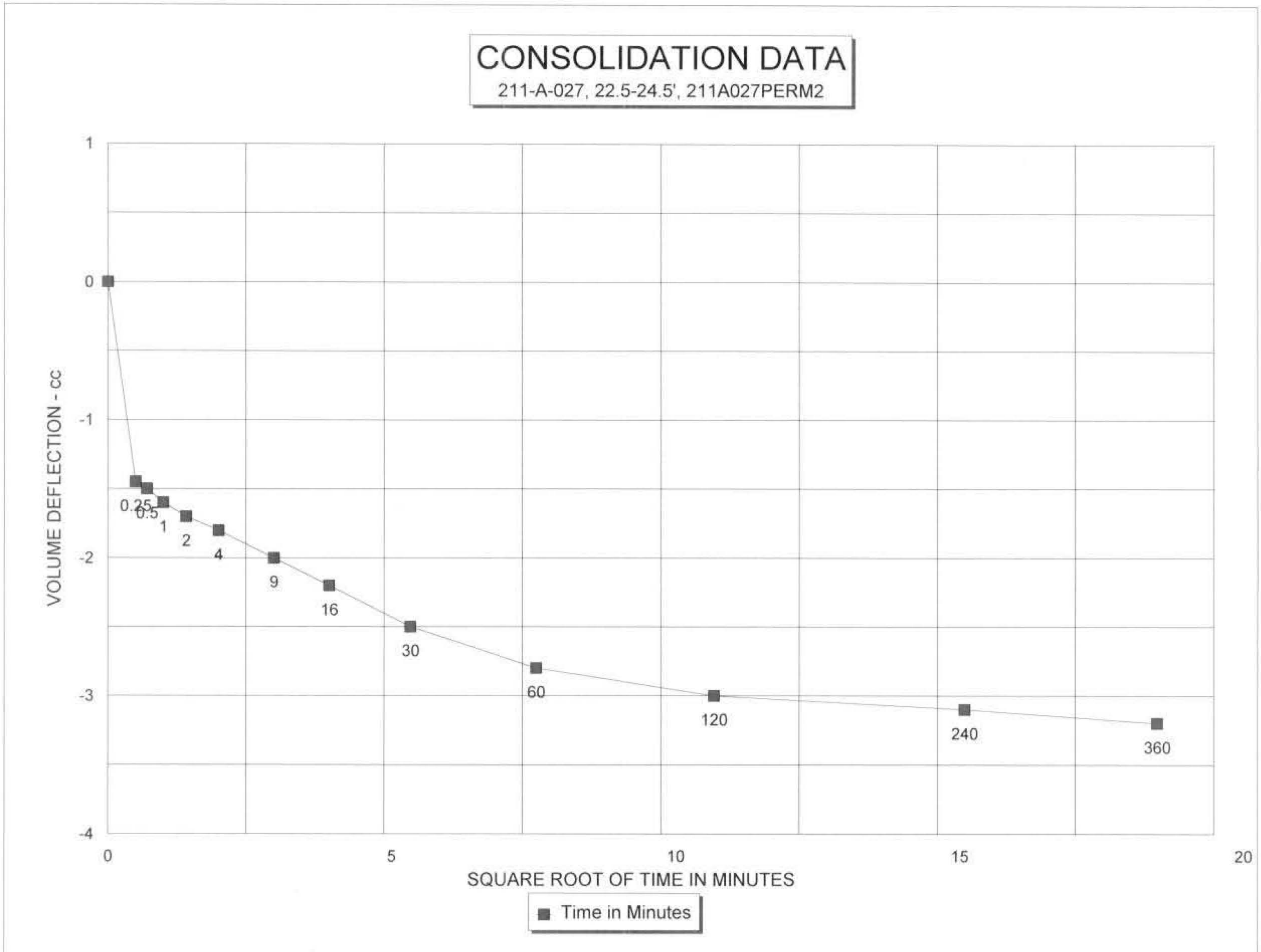
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 10.00 | 0.00 |
| 0.25 | 0.50 | 11.45 | -1.45 |
| 0.5 | 0.71 | 11.50 | -1.50 |
| 1 | 1.00 | 11.60 | -1.60 |
| 2 | 1.41 | 11.70 | -1.70 |
| 4 | 2.00 | 11.80 | -1.80 |
| 9 | 3.00 | 12.00 | -2.00 |
| 16 | 4.00 | 12.20 | -2.20 |
| 30 | 5.48 | 12.50 | -2.50 |
| 60 | 7.75 | 12.80 | -2.80 |
| 120 | 10.95 | 13.00 | -3.00 |
| 240 | 15.49 | 13.10 | -3.10 |
| 360 | 18.97 | 13.20 | -3.20 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.212 | Init. Vol. (CC) | 114.35 |
| Height Change (in) | 0.031 | Vol. Change (CC) | 12.10 |
| Ht. After Cons. (in) | 3.181 | Cell Exp. (CC) | 10.32 |
| Initial Area (sq in) | 2.172 | Net Change (CC) | 1.78 |
| Area After Cons. (sq in) | 2.159 | Cons. Vol. (CC) | 112.56 |

Data entry by: DAW Date: 10/16/2012
Checked by: OK Date: 10/16/12
FileName: LKP027P2

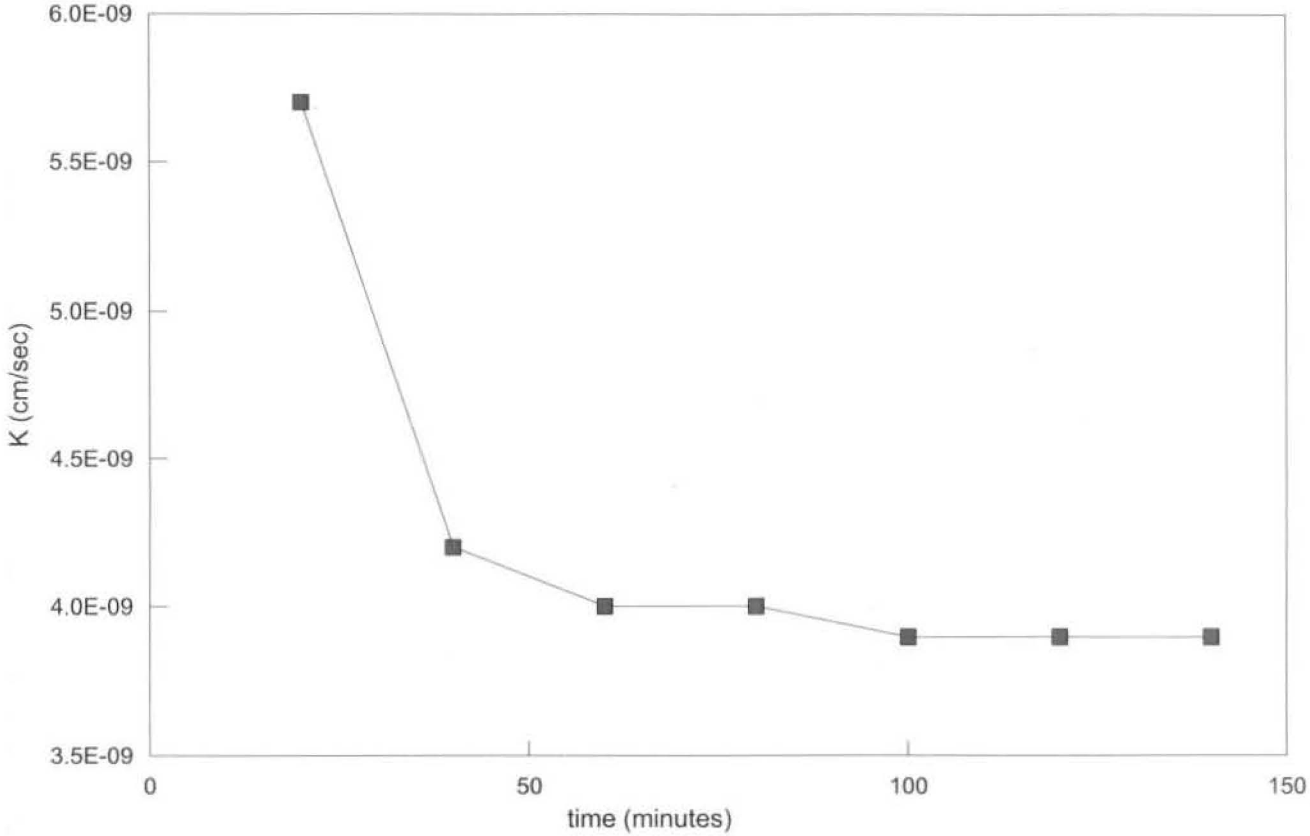
ADVANCED TERRA TESTING, INC. ATT



CONSOLIDATION DATA
211-A-027, 22.5-24.5', 211A027PERM2
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
1
0
-1
-2
-3
-4
0
5
10
15
20
0.25
0.5
1
2
4
9
16
30
60
120
240
360

# Preliminary Flow Pump Data

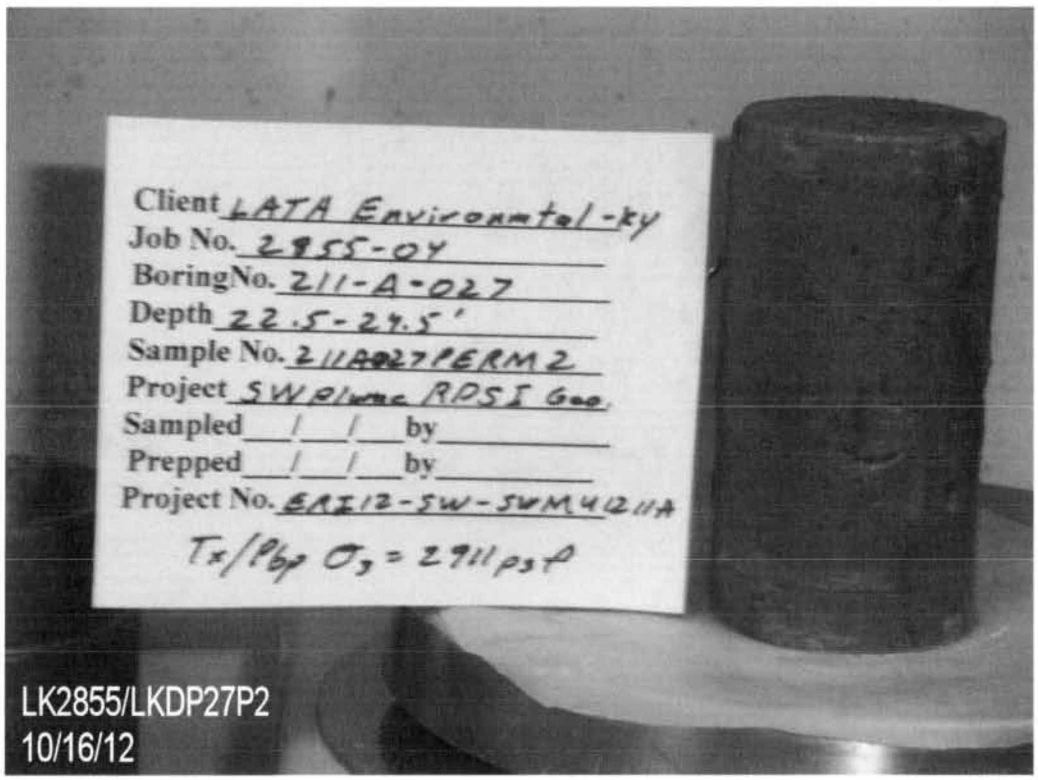
LATA, 211--027, 22.-24.5, 211A027PERM2




Average last 4 values
3.9E-09

Data Entered By: DPM
Data Checked By: DPW
File Name: LKFP27P2

Date: 10/15/2012
Date Checked 10/16/12


Client LATA Environmtal-ky
Job No. 2855-04
BoringNo. 211-A-027
Depth 22.5-24.5'
Sample No. 211A027PERM2
Project SW Plume RDSI Geo.
Sampled / / by
Prepped / / by
Project No. ERI12-SW-SWM41211A
Tx/Pbp $\sigma_3$ = 2911 psf
LK2855/LKDP27P2
10/16/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-02 |
| BORING NO. | MW513 | SAMPLED | 08/27/12 KD |
| DEPTH | 10-12' | TEST STARTED | 9/15/12 CAL |
| SAMPLE NO. | MW513 PERM1 | TEST FINISHED | 9/24/12 DPM |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 649.7 | 647.0 |
| Wt. Wet Soil & Pan (g) | 664.0 | 661.3 |
| Wt. Dry Soil & Pan (g) | 541.0 | 541.0 |
| Wt. Lost Moisture (g) | 122.9 | 120.2 |
| Wt. of Pan Only (g) | 14.2 | 14.2 |
| Wt. of Dry Soil (g) | 526.8 | 526.8 |
| Moisture Content % | 23.3 | 22.8 |
| Wet Density PCF | 127.0 | 129.8 |
| Dry Density PCF | 103.0 | 105.7 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 2.839 | (cm) | 7.211 |
| Init. Area (sq in) | 6.330 | (sq cm) | 40.843 |
| Init. Height (in) | 3.078 | (cm) | 7.818 |
| Vol. Bef. Consol. (cu ft) | 0.01128 | | |
| Vol. After Consol. (cu ft) | 0.01099 | | |
| Porosity % | 38.64 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting (gear number) | 11 |
| Percentage of Pump setting | 100 |
| Q (cc/s) | 5.71E-05 |
| Height | 3.052 |
| Diameter | 2.814 |
| Pressure (psi) | 0.429 |
| Area after consol. (cm*cm) | 40.129 |
| Gradient | 3.891 |
| Permeability k (cm/s) | 3.7E-07 |
| **Permeability k (m/s)** | **3.7E-09** |
| Back Pressure (psi) | 38.0 |
| Cell Pressure (psi) | 47.9 |
| Ave. Effective Stress (psi) | 9.686 |
| Average temperature degree C: | 22.5 |

Data entry by: DAW Date: 09/25/2012
Checked by: OAL Date: 9/26/12
FileName: LKP05131

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-02 |
| BORING NO. | MW513 | SAMPLED | 08/27/12 KD |
| DEPTH | 10-12' | TEST STARTED | 9/15/12 CAL |
| SAMPLE NO. | MW513 PERM1 | TEST FINISHED | 9/24/12 DPM |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Burette Reading (CC) Open | Pore Pressure (PSI) Close | Pore Pressure (PSI) Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 3.7 | 10.7 | | | | |
| 50.0 | | 11.7 | 12.0 | 39.1 | 49.1 | 10.0 | 1.00 |

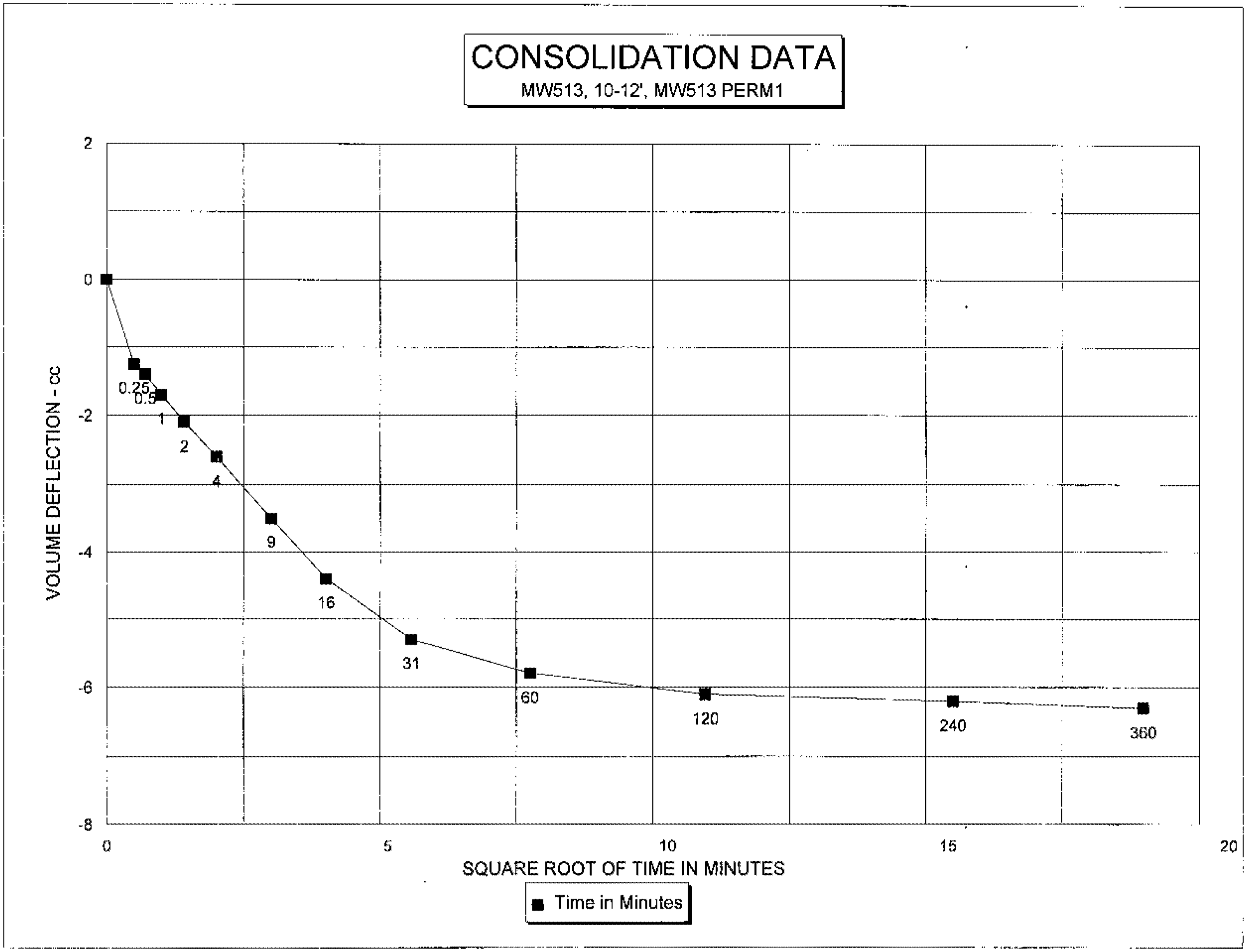
CONSOLIDATION DATA

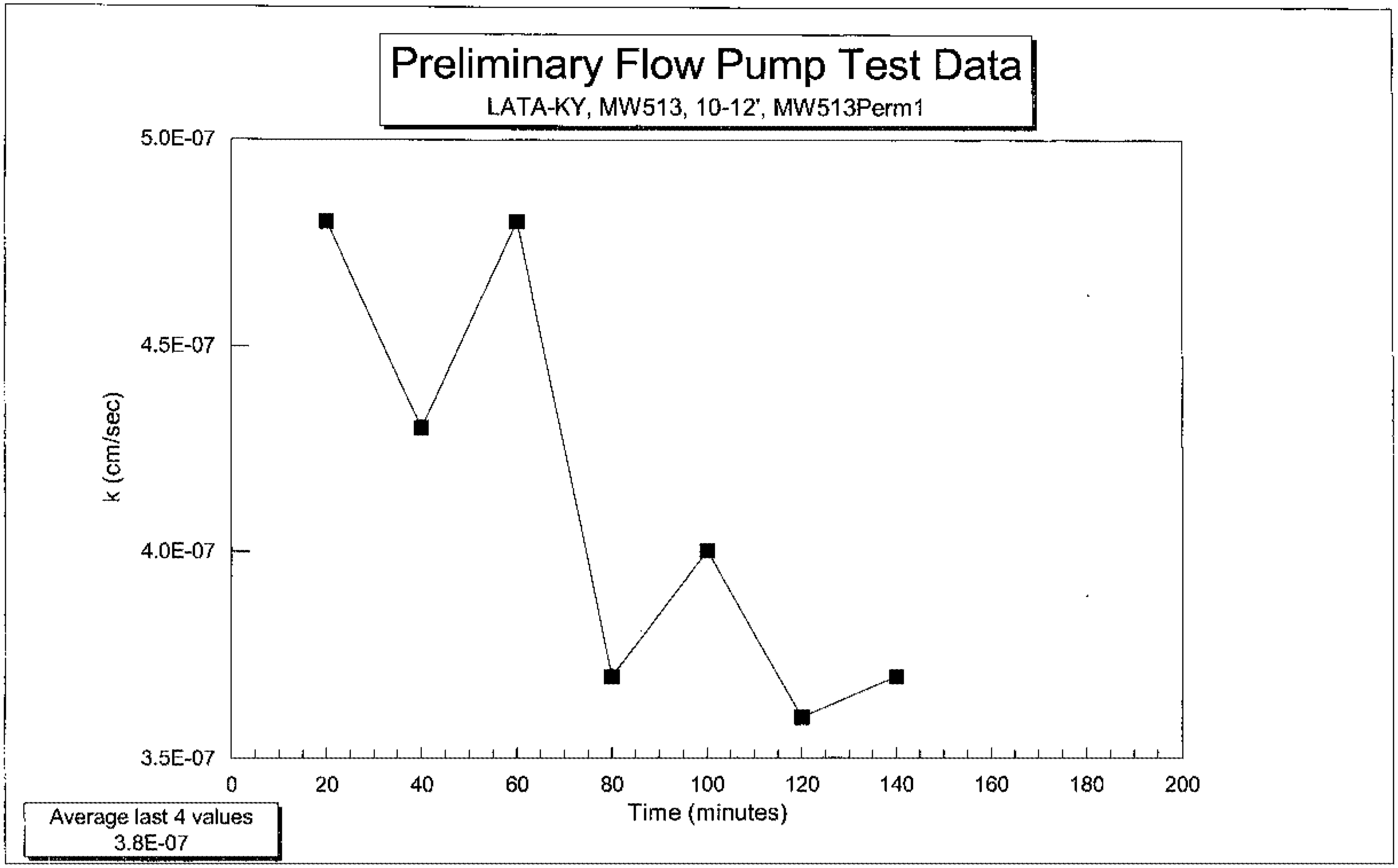
| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 12.10 | 0.00 |
| 0.25 | 0.50 | 13.35 | -1.25 |
| 0.5 | 0.71 | 13.50 | -1.40 |
| 1 | 1.00 | 13.80 | -1.70 |
| 2 | 1.41 | 14.20 | -2.10 |
| 4 | 2.00 | 14.70 | -2.60 |
| 9 | 3.00 | 15.60 | -3.50 |
| 16 | 4.00 | 16.50 | -4.40 |
| 31 | 5.57 | 17.40 | -5.30 |
| 60 | 7.75 | 17.90 | -5.80 |
| 120 | 10.95 | 18.20 | -6.10 |
| 240 | 15.49 | 18.30 | -6.20 |
| 360 | 18.97 | 18.40 | -6.30 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.078 | Init. Vol. (CC) | 319.35 |
| Height Change (in) | 0.026 | Vol. Change (CC) | 15.70 |
| Ht. After Cons. (in) | 3.052 | Cell Exp. (CC) | 7.49 |
| Initial Area (sq in) | 6.330 | Net Change (CC) | 8.21 |
| Area After Cons. (sq in) | 6.220 | Cons. Vol. (CC) | 311.14 |

Data entry by: DAW Date: 09/25/2012
Checked by: OKL Date: 9/26/12
FileName: LKP05131

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
MW513, 10-12', MW513 PERM1
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
2
0
-2
-4
-6
-8
0
5
10
15
20
0.25
0.5
1
2
4
9
16
31
60
120
240
360




Data Entered By: DPM
Date: 09/24/2012
Data Checked By: DAW
Date Checked: 9/25/12
File Name: LKFP5131

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT LATA Environmental Services-Ky JOB NO. 2855-02

| | | | |
|---|---|---|---|
| BORING NO. | MW513 | SAMPLED | 8/27/12 KD |
| DEPTH | 20-21' | TEST STARTED | 9/15/12 CAL |
| SAMPLE NO. | MW513Perm2 | TEST FINISHED | 9/29/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211A | CELL NUMBER | 11P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 3299 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 677.3 | 686.4 |
| Wt. Wet Soil & Pan (g) | 692.8 | 701.9 |
| Wt. Dry Soil & Pan (g) | 590.0 | 590.0 |
| Wt. Lost Moisture (g) | 102.8 | 112.0 |
| Wt. of Pan Only (g) | 15.5 | 15.5 |
| Wt. of Dry Soil (g) | 574.5 | 574.5 |
| Moisture Content % | 17.9 | 19.5 |
| Wet Density PCF | 133.0 | 146.4 |
| Dry Density PCF | 112.8 | 122.5 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 2.830 | (cm) | 7.188 |
| Init. Area (sq in) | 6.290 | (sq cm) | 40.584 |
| Init. Height (in) | 3.085 | (cm) | 7.836 |
| Vol. Bef. Consol. (cu ft) | 0.01123 | | |
| Vol. After Consol. (cu ft) | 0.01034 | | |
| Porosity % | 38.24 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 3.051 |
| Diameter | 2.730 |
| Pressure (psi) | 5.490 |
| Area after consol. (cm*cm) | 37.769 |
| Gradient | 49.808 |
| Permeability k (cm/s) | 5.6E-10 |
| **Permeability k (m/s)** | **5.6E-12** |
| Back Pressure (psi) | 88.0 |
| Cell Pressure (psi) | 111.0 |
| Ave. Effective Stress (psi) | 20.255 |

Average temperature degree C: 23.4

Data entry by: MLM Date: 10/01/2012
Checked by: CAL Date: 10/02/12
FileName: LKP05132

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-02 |
| BORING NO. | MW513 | SAMPLED | 8/27/12 KD |
| DEPTH | 20-21' | TEST STARTED | 9/15/12 CAL |
| SAMPLE NO. | MW513Perm2 | TEST FINISHED | 9/29/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211A | SETUP NO. | 11P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 3299 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Open | Pore Pressure (PSI) Close | Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 4.7 | 13.7 | | | | |
| 50.0 | 48.0 | 15.5 | 18.0 | 38.5 | 46.6 | 8.1 | 0.81 |
| 60.0 | 58.0 | 22.7 | 24.1 | 48.4 | 57.5 | 9.1 | 0.91 |
| 70.0 | 68.0 | 26.9 | 27.8 | 58.7 | 68.0 | 9.3 | 0.93 |
| 80.0 | 78.0 | 28.3 | 29.1 | 68.5 | 77.8 | 9.3 | 0.93 |
| 90.0 | 88.0 | 29.8 | 30.5 | 78.4 | 87.8 | 9.4 | 0.94 |
| 100.0 | | 31.1 | 31.1 | 88.5 | 98.0 | 9.5 | 0.95 |

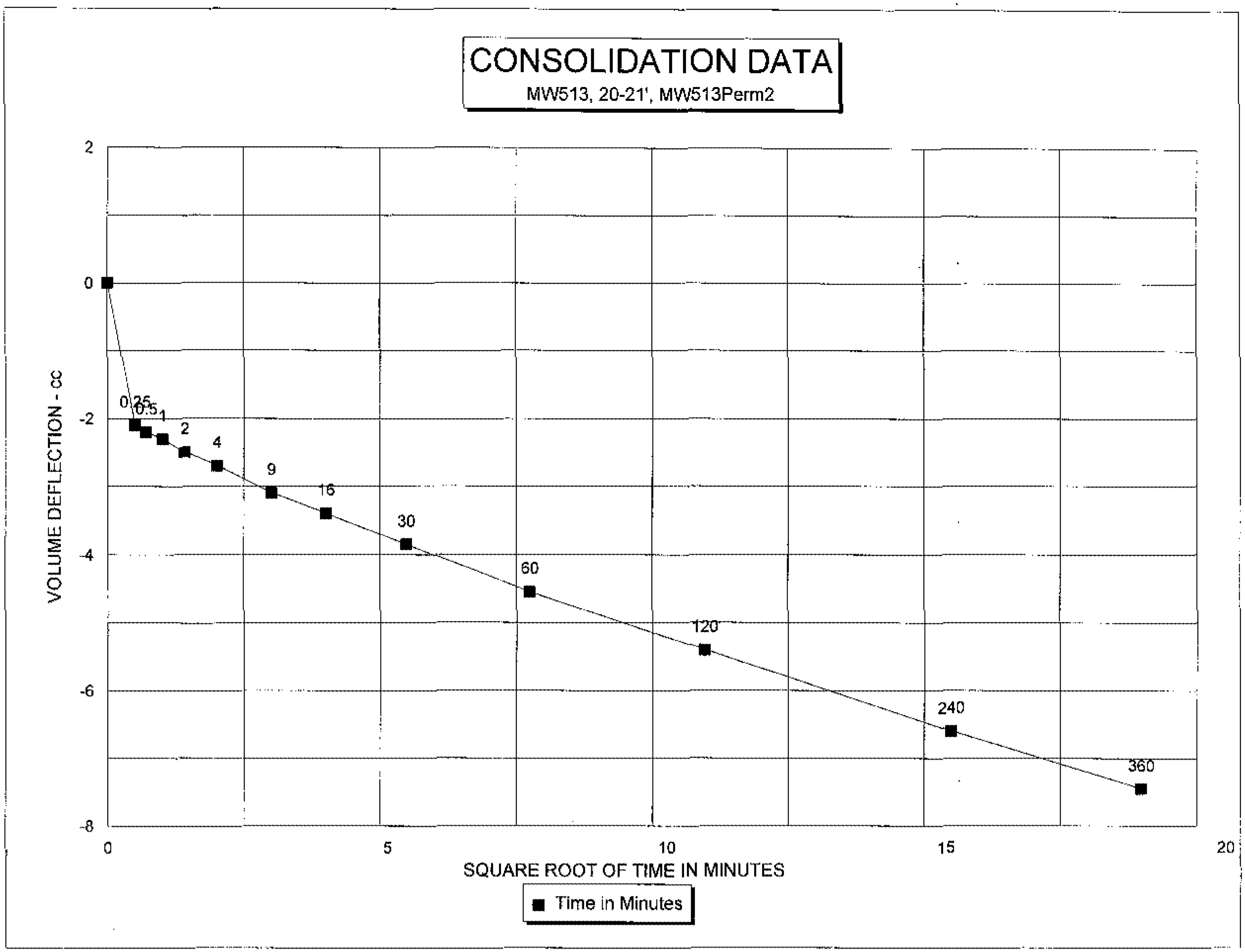
CONSOLIDATION DATA

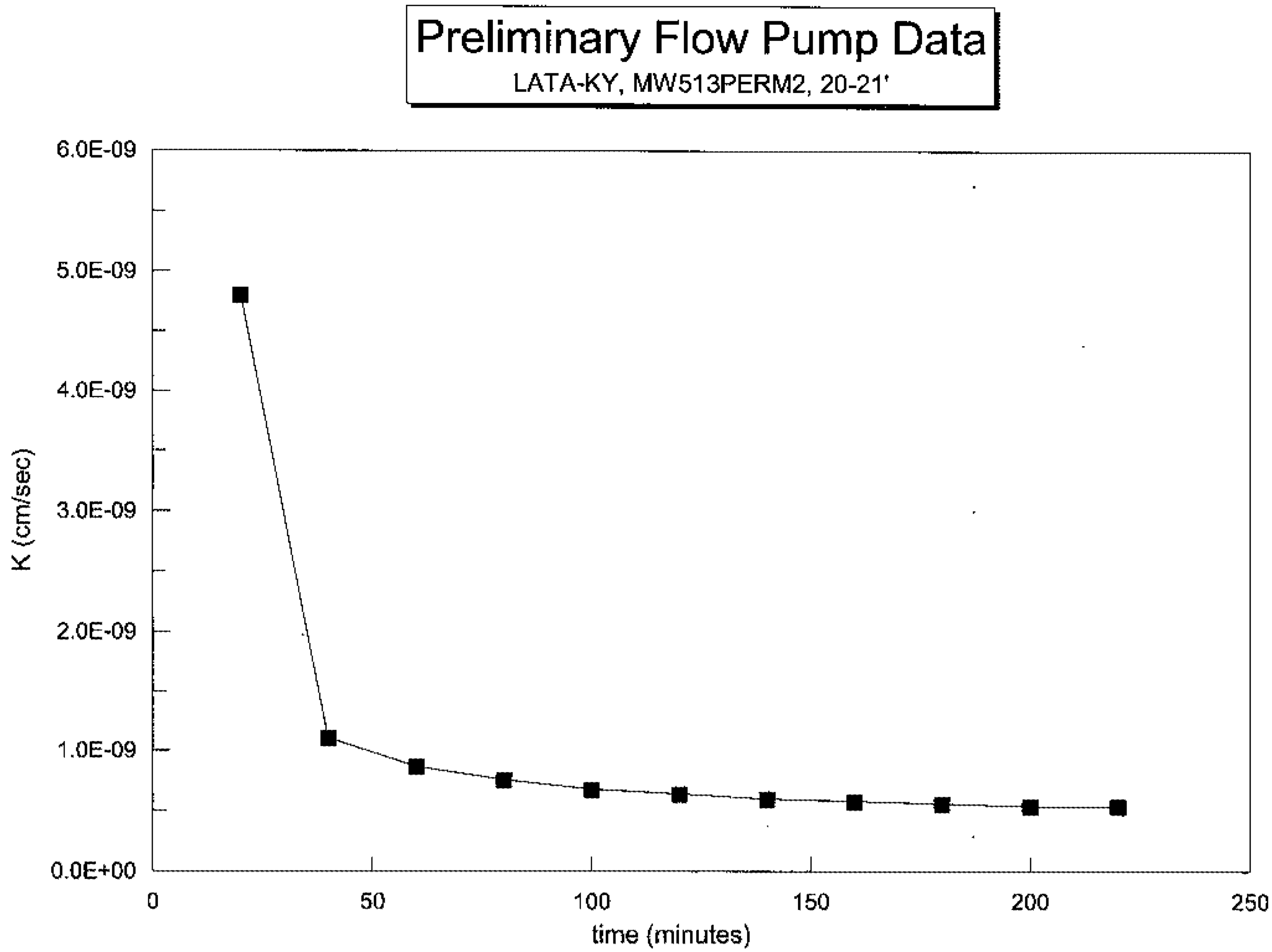
| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.50 | 0.00 |
| 0.25 | 0.50 | 2.60 | -2.10 |
| 0.5 | 0.71 | 2.70 | -2.20 |
| 1 | 1.00 | 2.80 | -2.30 |
| 2 | 1.41 | 3.00 | -2.50 |
| 4 | 2.00 | 3.20 | -2.70 |
| 9 | 3.00 | 3.60 | -3.10 |
| 16 | 4.00 | 3.90 | -3.40 |
| 30 | 5.48 | 4.35 | -3.85 |
| 60 | 7.75 | 5.05 | -4.55 |
| 120 | 10.95 | 5.90 | -5.40 |
| 240 | 15.49 | 7.10 | -6.60 |
| 360 | 18.97 | 7.95 | -7.45 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.085 | Init. Vol. (CC) | 318.05 |
| Height Change (in) | 0.034 | Vol. Change (CC) | 40.85 |
| Ht. After Cons. (in) | 3.051 | Cell Exp. (CC) | 15.55 |
| Initial Area (sq in) | 6.290 | Net Change (CC) | 25.30 |
| Area After Cons. (sq in) | 5.854 | Cons. Vol. (CC) | 292.75 |

Data entry by: MLM Date: 10/01/2012
Checked by: CAL Date: 10/02/12
FileName: LKP05132

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
MW513, 20-21', MW513Perm2
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
2
0
-2
-4
-6
-8
0
5
10
15
20
0.25
0.5
1
2
4
9
16
30
60
120
240
360




Average last 4 values
5.5E-10

Data Entered By: CAL
Data Checked By: JM
File Name: LKFP5132

Date: 9/29/2012
Date Checked 10/01/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-02 |
| BORING NO. | MW513 | SAMPLED | 08/23/12 KD |
| DEPTH | 40-42' | TEST STARTED | 09/15/12 CAL |
| SAMPLE NO. | MW513PERM3 | TEST FINISHED | 09/26/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | CELL NUMBER | 1P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5305 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 657.4 | 659.7 |
| Wt. Wet Soil & Pan (g) | 664.1 | 666.5 |
| Wt. Dry Soil & Pan (g) | 540.4 | 540.4 |
| Wt. Lost Moisture (g) | 123.7 | 126.1 |
| Wt. of Pan Only (g) | 6.7 | 6.7 |
| Wt. of Dry Soil (g) | 533.7 | 533.7 |
| Moisture Content % | 23.2 | 23.6 |
| Wet Density PCF | 126.7 | 136.8 |
| Dry Density PCF | 102.8 | 110.6 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 2.857 | (cm) | 7.257 |
| Init. Area (sq in) | 6.411 | (sq cm) | 41.362 |
| Init. Height (in) | 3.084 | (cm) | 7.833 |
| Vol. Bef. Consol. (cu ft) | 0.01144 | | |
| Vol. After Consol. (cu ft) | 0.01064 | | |
| Porosity % | 41.86 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting (gear number) | 11 |
| Percentage of Pump setting | 100 |
| Q (cc/s) | 5.71E-05 |
| Height | 3.057 |
| Diameter | 2.767 |
| Pressure (psi) | 0.850 |
| Area after consol. (cm*cm) | 38.786 |
| Gradient | 7.697 |
| Permeability k (cm/s) | 1.9E-07 |
| **Permeability k (m/s)** | **1.9E-09** |
| Back Pressure (psi) | 48.0 |
| Cell Pressure (psi) | 84.8 |
| Ave. Effective Stress (psi) | 36.375 |
| Average temperature degree C: | 22.5 |

Data entry by: DAW Date: 09/27/2012
Checked by: CAL Date: 9/27/2012
FileName: LKP05133

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-02 |
| BORING NO. | MW513 | SAMPLED | 08/23/12 KD |
| DEPTH | 40-42' | TEST STARTED | 09/15/12 CAL |
| SAMPLE NO. | MW513PERM3 | TEST FINISHED | 09/26/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211A | SETUP NO. | 1P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5305 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Burette Reading (CC) Open | Pore Pressure (PSI) Close | Pore Pressure (PSI) Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 4.2 | 15.6 | | | | |
| 50.0 | 48.0 | 20.9 | 24.6 | 38.8 | 45.3 | 6.5 | 0.65 |
| 60.0 | | 24.3 | 25.5 | 48.9 | 58.7 | 9.8 | 0.98 |

CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.10 | 0.00 |
| 0.25 | 0.50 | 4.95 | -4.85 |
| 0.5 | 0.71 | 5.20 | -5.10 |
| 1 | 1.00 | 5.60 | -5.50 |
| 2 | 1.41 | 6.20 | -6.10 |
| 4 | 2.00 | 7.00 | -6.90 |
| 9 | 3.00 | 8.40 | -8.30 |
| 16 | 4.00 | 9.60 | -9.50 |
| 30 | 5.48 | 10.70 | -10.60 |
| 64 | 8.00 | 11.50 | -11.40 |
| 120 | 10.95 | 11.85 | -11.75 |
| 240 | 15.49 | 12.10 | -12.00 |
| 360 | 18.97 | 12.20 | -12.10 |

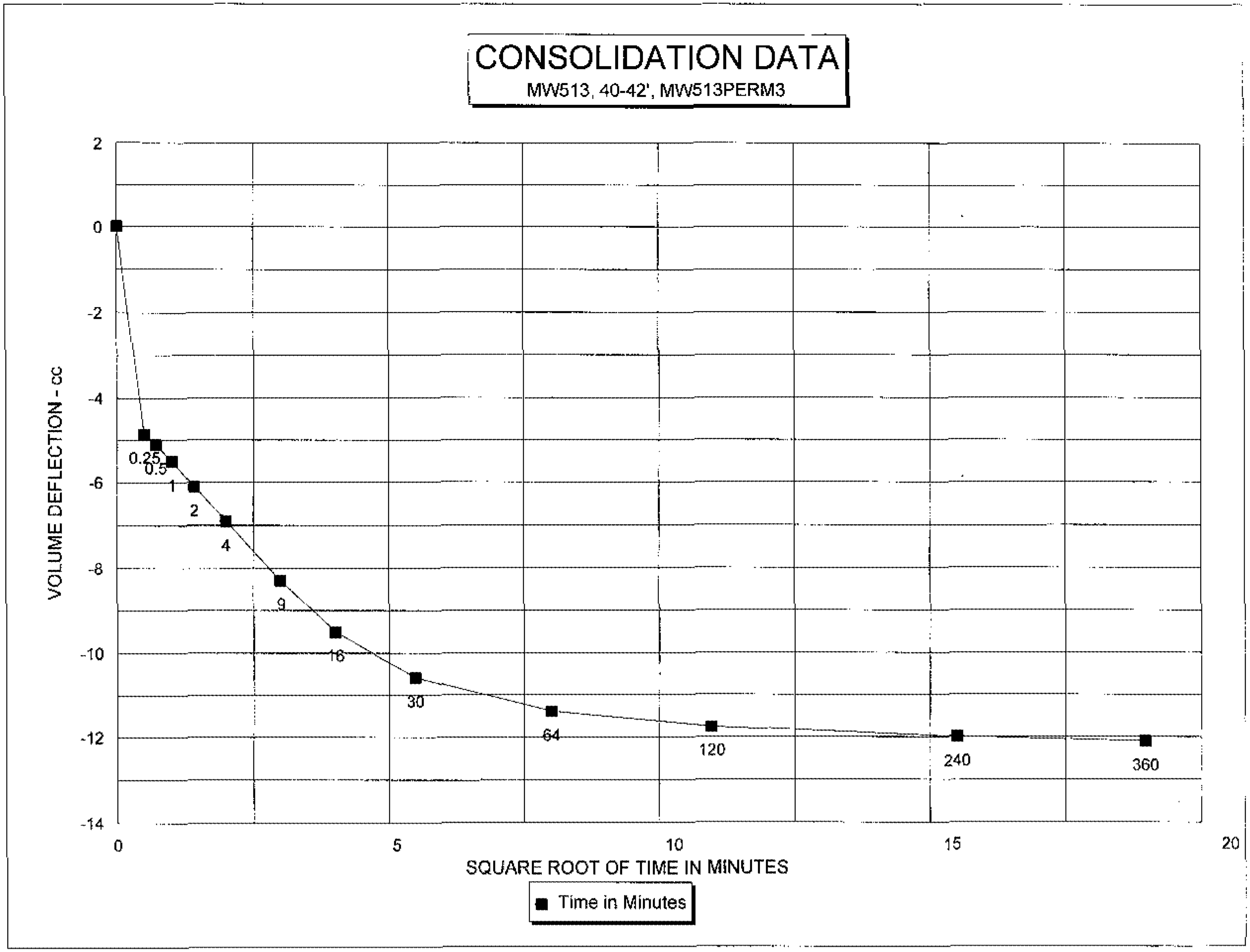
| | | | |
|---|---|---|---|
| Initial Height (in) | 3.084 | Init. Vol. (CC) | 324.04 |
| Height Change (in) | 0.027 | Vol. Change (CC) | 36.40 |
| Ht. After Cons. (in) | 3.057 | Cell Exp. (CC) | 13.57 |
| Initial Area (sq in) | 6.411 | Net Change (CC) | 22.83 |
| Area After Cons. (sq in) | 6.012 | Cons. Vol. (CC) | 301.22 |

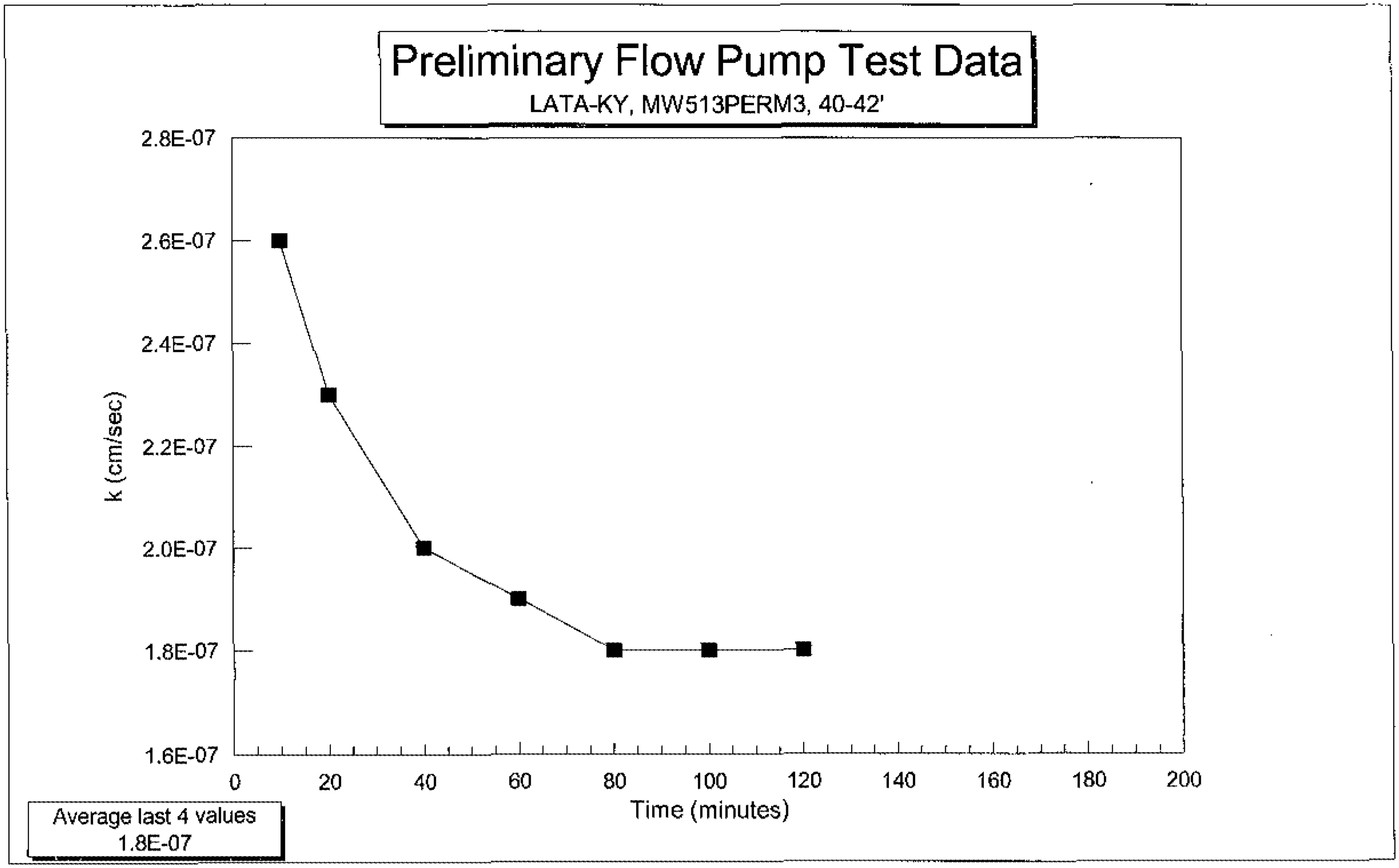
Data entry by: DAW Date: 09/27/2012

Checked by: CA Date: 9/27/2012

FileName: LKP05133

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
MW513, 40-42', MW513PERM3
VOLUME DEFLECTION - cc
2
0
-2
-4
-6
-8
-10
-12
-14
0.25
0.5
1
2
4
9
16
30
64
120
240
360
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes




Data Entered By: CAL
Data Checked By: CAL
File Name: LKFP5133

Date: 9/26/2012
Date Checked: 9/27/2012

Grain Size Analysis

ASTM D422

Advanced Terra Testing

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-007 | SAMPLED | 10/16/12 KD |
| DEPTH | 8.0-12.0' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B007GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 185.05 |
| Wt. Dry Soil & Pan (g) | 182.81 |
| Wt. Lost Moisture (g) | 2.24 |
| Wt. of Pan Only (g) | 6.53 |
| Wt. of Dry Soil (g) | 176.28 |
| Moisture Content % | 1.3 |
| Wt. Hydrom. Sample Wet (g) | 66.01 |
| Wt. Hydrom. Sample Dry (g) | 65.18 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 973.66 |
| Weight of + #10 Before Washing (g) | 0.00 |
| Weight of + #10 After Washing (g) | 0.00 |
| Weight of - #10 Wet (g) | 973.66 |
| Weight of - #10 Dry (g) | 961.44 |
| Wt. Total Sample Dry (g) | 961.44 |
| Calc. Wt. "W" (g) | 65.18 |
| Calc. Mass + #10 | 0.00 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #20 | 3.18 | 3.33 | 0.15 | 0.15 | 0.2 | 99.8 |
| #40 | 3.02 | 3.30 | 0.29 | 0.44 | 0.7 | 99.3 |
| #60 | 3.12 | 4.59 | 1.47 | 1.91 | 2.9 | 97.1 |
| #100 | 3.17 | 6.77 | 3.60 | 5.52 | 8.5 | 91.5 |
| #200 | 3.02 | 5.61 | 2.59 | 8.11 | 12.4 | 87.6 |

Data entered by: MLM Date: 11/12/2012
Data checked by: Date: 11/12/12
FileName: LKHY07Z1

ADVANCED TERRA TESTING, INC.
ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-007 | SAMPLED | 10/16/12 KD |
| DEPTH | 8.0-12.0' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B007GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

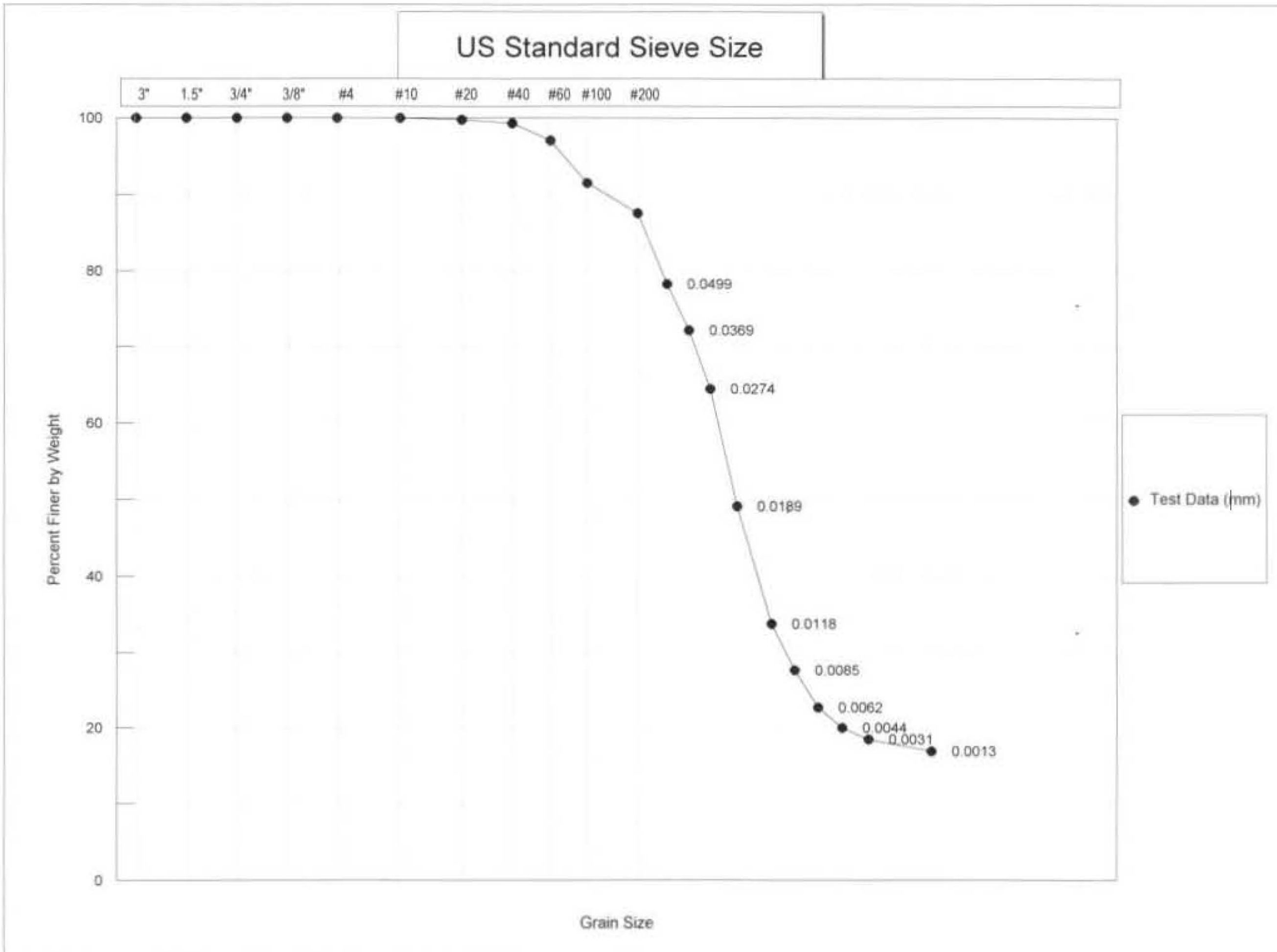
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.6 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01323 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 65.178 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | 56.00 | 51.00 | 78.2 | 78.2 | 7.11 | 0.0499 |
| 1.0 | 52.00 | 47.00 | 72.1 | 72.1 | 7.76 | 0.0369 |
| 2.0 | 47.00 | 42.00 | 64.4 | 64.4 | 8.58 | 0.0274 |
| 5.0 | 37.00 | 32.00 | 49.1 | 49.1 | 10.22 | 0.0189 |
| 15.0 | 27.00 | 22.00 | 33.8 | 33.8 | 11.86 | 0.0118 |
| 30.0 | 23.00 | 18.00 | 27.6 | 27.6 | 12.52 | 0.0085 |
| 60.0 | 19.75 | 14.75 | 22.6 | 22.6 | 13.05 | 0.0062 |
| 120.0 | 18.00 | 13.00 | 19.9 | 19.9 | 13.34 | 0.0044 |
| 250.0 | 17.00 | 12.00 | 18.4 | 18.4 | 13.50 | 0.0031 |
| 1440.0 | 16.00 | 11.00 | 16.9 | 16.9 | 13.67 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/12/2012
Data checked by: CM Date: 11/12/12
FileName: LKHY07Z1

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky
Boring No.: 211-B-007
Sample No.: 211B007GRNSZ1
Job Number: 2855-06
Depth: 8.0-12.0'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-007 | SAMPLED | 10/16/12 KD |
| DEPTH | 27.5-31.5 | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B007GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 113.21 |
| Wt. Dry Soil & Pan (g) | 111.93 |
| Wt. Lost Moisture (g) | 1.28 |
| Wt. of Pan Only (g) | 8.34 |
| Wt. of Dry Soil (g) | 103.59 |
| Moisture Content % | 1.2 |
| Wt. Hydrom. Sample Wet (g) | 67.71 |
| Wt. Hydrom. Sample Dry (g) | 66.89 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 863.29 |
| Weight of + #10 Before Washing (g) | 2.64 |
| Weight of + #10 After Washing (g) | 2.49 |
| Weight of - #10 Wet (g) | 860.65 |
| Weight of - #10 Dry (g) | 850.29 |
| Wt. Total Sample Dry (g) | 852.78 |
| Calc. Wt. "W" (g) | 67.08 |
| Calc. Mass + #10 | 0.20 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 1.23 | 1.23 | 1.23 | 0.1 | 99.9 |
| #10 | 0.00 | 1.26 | 1.26 | 2.49 | 0.3 | 99.7 |
| #20 | 3.02 | 3.24 | 0.22 | 0.22 | 0.6 | 99.4 |
| #40 | 3.10 | 4.19 | 1.09 | 1.32 | 2.3 | 97.7 |
| #60 | 3.00 | 7.60 | 4.60 | 5.92 | 9.1 | 90.9 |
| #100 | 3.07 | 11.15 | 8.08 | 13.99 | 21.1 | 78.9 |
| #200 | 3.21 | 12.13 | 8.92 | 22.92 | 34.5 | 65.5 |

Data entered by: MLM Date: 11/12/2012
Data checked by: CJL Date: 11/12/12
FileName: LKHY07Z2

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-06

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-007 | SAMPLED | 10/16/12 KD |
| DEPTH | 27.5-31.5 | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B007GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

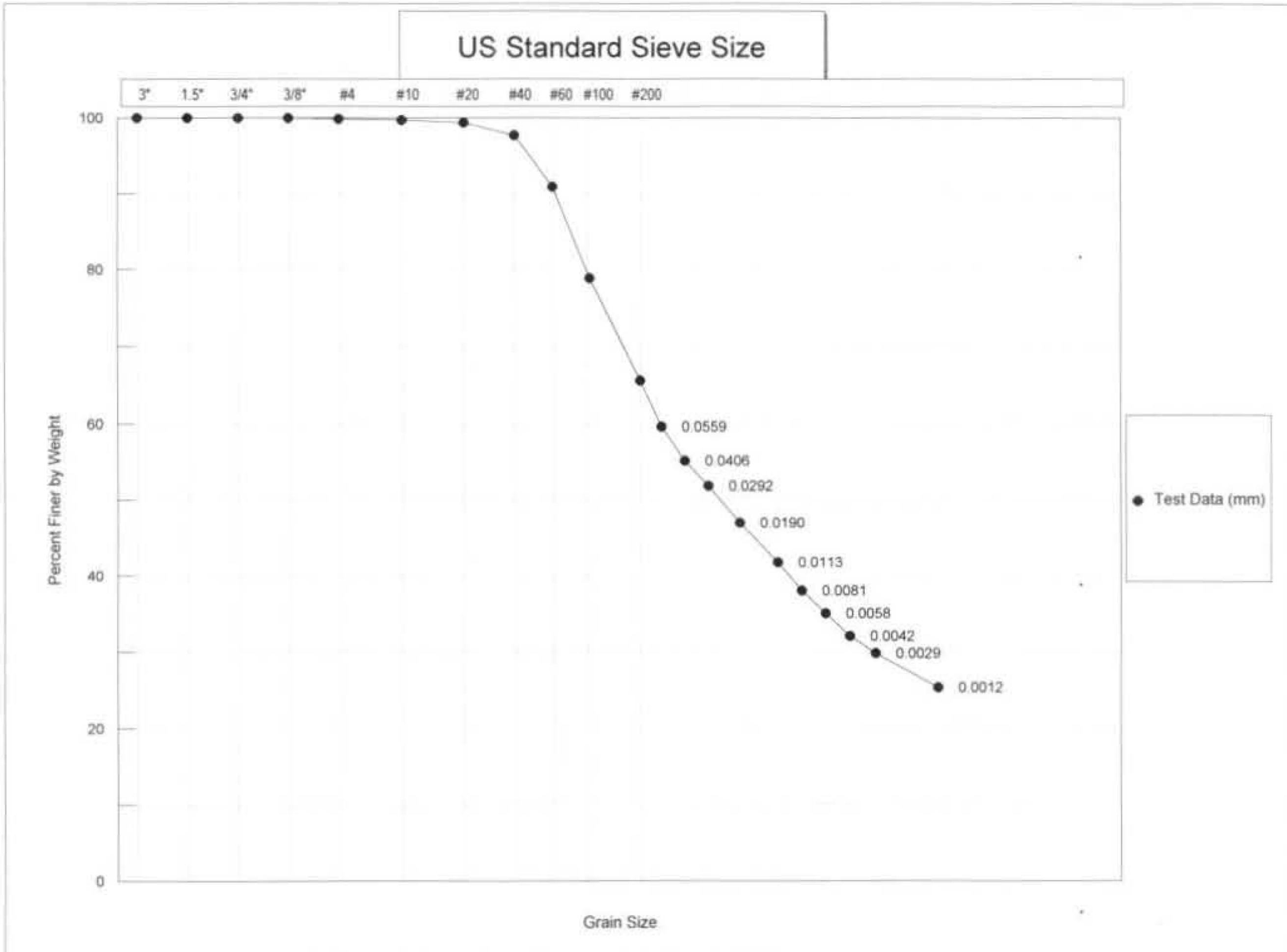
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.6 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01323 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 67.083 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | 45.00 | 40.00 | 59.6 | 59.6 | 8.91 | 0.0559 |
| 1.0 | 42.00 | 37.00 | 55.2 | 55.2 | 9.40 | 0.0406 |
| 2.0 | 39.75 | 34.75 | 51.8 | 51.8 | 9.77 | 0.0292 |
| 5.0 | 36.50 | 31.50 | 47.0 | 47.0 | 10.30 | 0.0190 |
| 15.0 | 33.00 | 28.00 | 41.7 | 41.7 | 10.88 | 0.0113 |
| 30.0 | 30.50 | 25.50 | 38.0 | 38.0 | 11.29 | 0.0081 |
| 60.0 | 28.50 | 23.50 | 35.0 | 35.0 | 11.62 | 0.0058 |
| 120.0 | 26.50 | 21.50 | 32.0 | 32.0 | 11.94 | 0.0042 |
| 250.0 | 25.00 | 20.00 | 29.8 | 29.8 | 12.19 | 0.0029 |
| 1440.0 | 22.00 | 17.00 | 25.3 | 25.3 | 12.68 | 0.0012 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/12/2012
Data checked by: [signature] Date: 11/12/12
FileName: LKHY07Z2

ADVANCED TERRA TESTING, INC.
ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-B-007 Sample No.: 211B007GRNSZ2
Job Number: 2855-06 Depth: 27.5-31.5
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky | JOB NO. 2855-06

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-007 | SAMPLED | 10/16/12 KD |
| DEPTH | 42.5-44.0 | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B007GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 108.24 |
| Wt. Dry Soil & Pan (g) | 107.11 |
| Wt. Lost Moisture (g) | 1.13 |
| Wt. of Pan Only (g) | 8.21 |
| Wt. of Dry Soil (g) | 98.90 |
| Moisture Content % | 1.1 |
| Wt. Hydrom. Sample Wet (g) | 67.25 |
| Wt. Hydrom. Sample Dry (g) | 66.49 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 890.19 |
| Weight of + #10 Before Washing (g) | 476.93 |
| Weight of + #10 After Washing (g) | 463.85 |
| Weight of - #10 Wet (g) | 413.26 |
| Weight of - #10 Dry (g) | 421.52 |
| Wt. Total Sample Dry (g) | 885.37 |
| Calc. Wt. "W" (g) | 139.65 |
| Calc. Mass + #10 | 73.16 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 19.48 | 19.48 | 19.48 | 2.2 | 97.8 |
| 3/8" | 0.00 | 139.98 | 139.98 | 159.46 | 18.0 | 82.0 |
| #4 | 0.00 | 167.21 | 167.21 | 326.67 | 36.9 | 63.1 |
| #10 | 0.00 | 137.18 | 137.18 | 463.85 | 52.4 | 47.6 |
| #20 | 3.25 | 15.75 | 12.50 | 12.50 | 61.3 | 38.7 |
| #40 | 3.08 | 14.50 | 11.42 | 23.93 | 69.5 | 30.5 |
| #60 | 3.29 | 14.99 | 11.70 | 35.62 | 77.9 | 22.1 |
| #100 | 3.12 | 10.27 | 7.16 | 42.78 | 83.0 | 17.0 |
| #200 | 2.98 | 6.45 | 3.47 | 46.25 | 85.5 | 14.5 |

Data entered by: MLM Date: 11/12/2012
Data checked by: Date: 11/12/12
FileName: LKHY07Z3

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-007 | SAMPLED | 10/16/12 KD |
| DEPTH | 42.5-44.0 | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B007GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

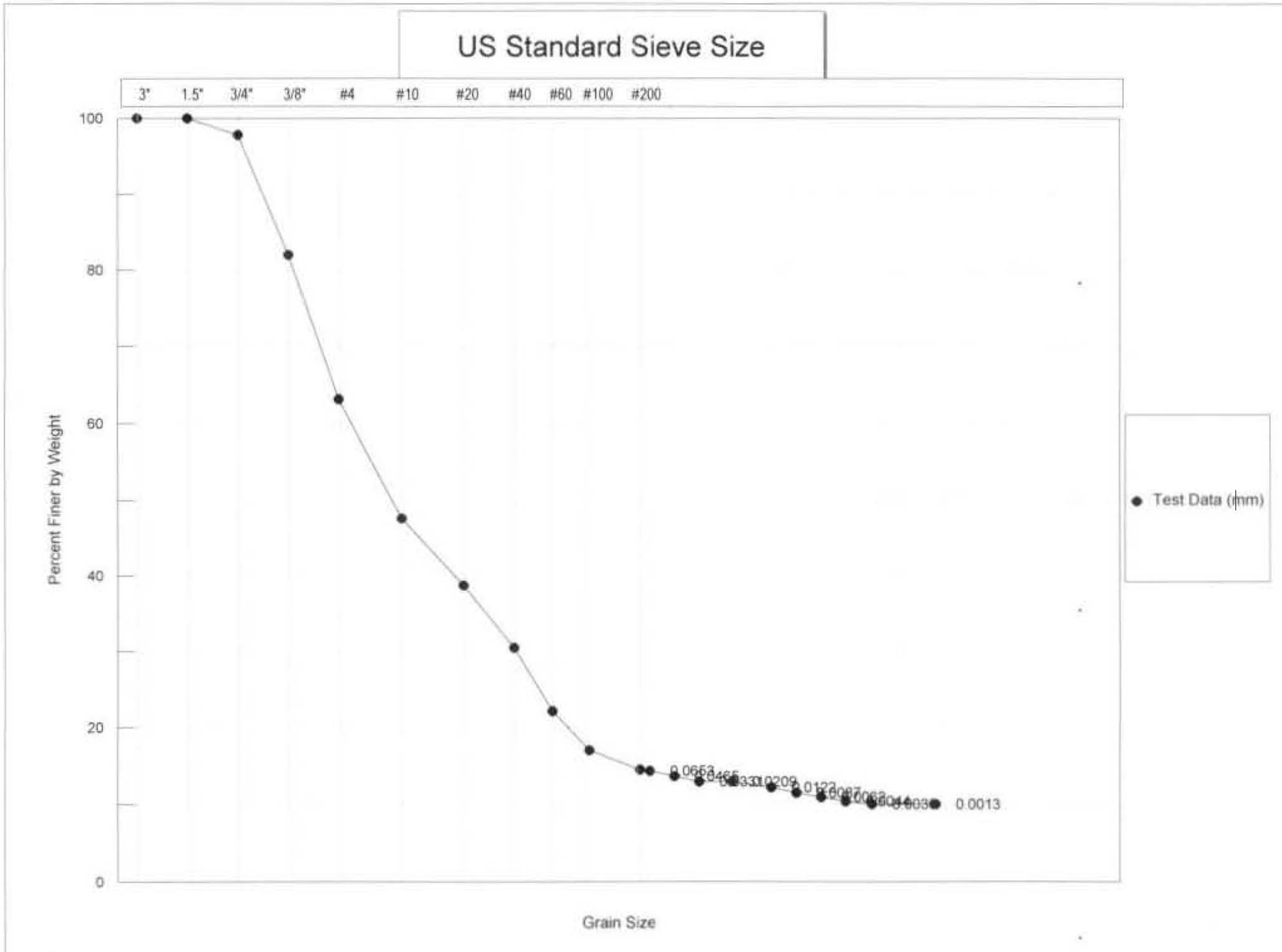
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.6 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01323 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 139.649 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | 25.00 | 20.00 | 14.3 | 14.3 | 12.19 | 0.0653 |
| 1.0 | 24.00 | 19.00 | 13.6 | 13.6 | 12.35 | 0.0465 |
| 2.0 | 23.00 | 18.00 | 12.9 | 12.9 | 12.52 | 0.0331 |
| 5.0 | 23.00 | 18.00 | 12.9 | 12.9 | 12.52 | 0.0209 |
| 15.0 | 22.00 | 17.00 | 12.2 | 12.2 | 12.68 | 0.0122 |
| 30.0 | 21.00 | 16.00 | 11.5 | 11.5 | 12.85 | 0.0087 |
| 60.0 | 20.25 | 15.25 | 10.9 | 10.9 | 12.97 | 0.0062 |
| 120.0 | 19.50 | 14.50 | 10.4 | 10.4 | 13.09 | 0.0044 |
| 250.0 | 19.00 | 14.00 | 10.0 | 10.0 | 13.17 | 0.0030 |
| 1442.0 | 19.00 | 14.00 | 10.0 | 10.0 | 13.17 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/12/2012
Data checked by: Date: 11/12/12
FileName: LKHY07Z3

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) |
|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | |

USCS

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY |
|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | |

WENTWORTH

Client: LATA Kentucky
Boring No.: 211-B-007
Sample No.: 211B007GRNSZ3
Job Number: 2855-06
Depth: 42.5-44.0
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 5-7.5' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B004GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 33.59 |
| Wt. Dry Soil & Pan (g) | 33.24 |
| Wt. Lost Moisture (g) | 0.35 |
| Wt. of Pan Only (g) | 3.04 |
| Wt. of Dry Soil (g) | 30.20 |
| Moisture Content % | 1.2 |
| Wt. Hydrom. Sample Wet (g) | 70.23 |
| Wt. Hydrom. Sample Dry (g) | 69.42 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1085.85 |
| Weight of + #10 Before Washing (g) | 2.34 |
| Weight of + #10 After Washing (g) | 1.85 |
| Weight of - #10 Wet (g) | 1083.51 |
| Weight of - #10 Dry (g) | 1071.58 |
| Wt. Total Sample Dry (g) | 1073.43 |
| Calc. Wt. "W" (g) | 69.54 |
| Calc. Mass + #10 | 0.12 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 0.83 | 0.83 | 0.83 | 0.1 | 99.9 |
| #10 | 0.00 | 1.02 | 1.02 | 1.85 | 0.2 | 99.8 |
| #20 | 3.00 | 3.26 | 0.25 | 0.25 | 0.5 | 99.5 |
| #40 | 3.00 | 3.32 | 0.31 | 0.56 | 1.0 | 99.0 |
| #60 | 3.08 | 3.98 | 0.91 | 1.47 | 2.3 | 97.7 |
| #100 | 2.97 | 4.73 | 1.76 | 3.24 | 4.8 | 95.2 |
| #200 | 3.08 | 4.22 | 1.14 | 4.38 | 6.5 | 93.5 |

Data entered by: MLM Date: 11/12/2012
Data checked by: SLL Date: 11/12/12
FileName: LKHY04Z1

ADVANCED TERRA TESTING, INC.

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 5-7.5' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B004GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

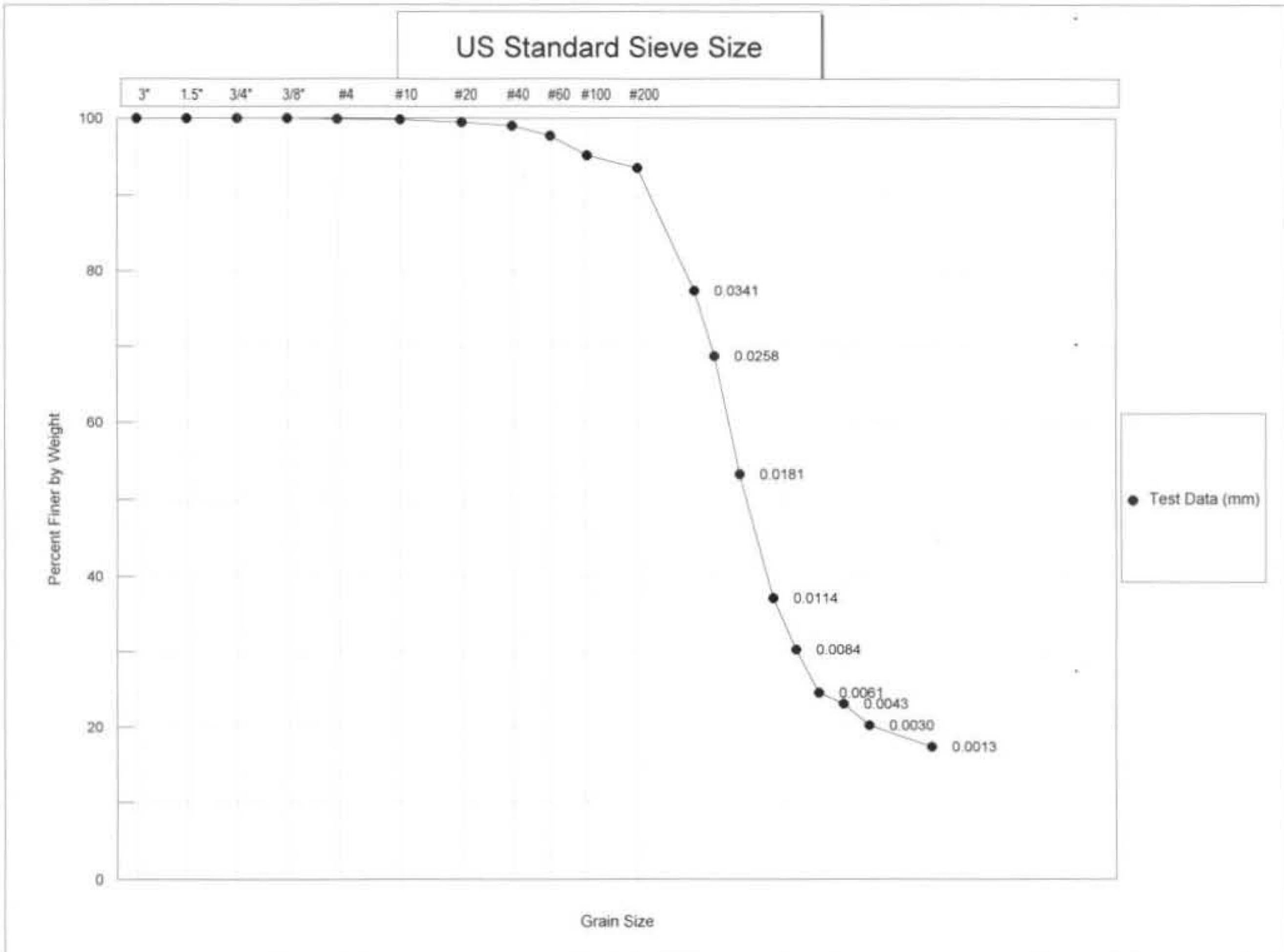
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.7 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01322 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 69.543 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 58.75 | 53.75 | 77.3 | 77.3 | 6.66 | 0.0341 |
| 2.0 | 52.75 | 47.75 | 68.7 | 68.7 | 7.64 | 0.0258 |
| 5.0 | 42.00 | 37.00 | 53.2 | 53.2 | 9.40 | 0.0181 |
| 15.0 | 30.75 | 25.75 | 37.0 | 37.0 | 11.25 | 0.0114 |
| 30.0 | 26.00 | 21.00 | 30.2 | 30.2 | 12.03 | 0.0084 |
| 60.0 | 22.00 | 17.00 | 24.4 | 24.4 | 12.68 | 0.0061 |
| 120.0 | 21.00 | 16.00 | 23.0 | 23.0 | 12.85 | 0.0043 |
| 250.0 | 19.00 | 14.00 | 20.1 | 20.1 | 13.17 | 0.0030 |
| 1440.0 | 17.00 | 12.00 | 17.3 | 17.3 | 13.50 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/12/2012
Data checked by: [signature] Date: 11/12/12
FileName: LKHY04Z1

ADVANCED TERRA TESTING, INC.




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky    Boring No.: 211-B-004    Sample No.: 211B004GRNSZ1
Job Number: 2855-6    Depth: 5-7.5'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-6

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 21.1-23.5' | DATE TESTED | 11/5/12 SKL |
| SAMPLE NO. | 211B004GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 74.00 |
| Wt. Dry Soil & Pan (g) | 73.31 |
| Wt. Lost Moisture (g) | 0.69 |
| Wt. of Pan Only (g) | 3.13 |
| Wt. of Dry Soil (g) | 70.18 |
| Moisture Content % | 1.0 |
| Wt. Hydrom. Sample Wet (g) | 71.67 |
| Wt. Hydrom. Sample Dry (g) | 70.97 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1098.78 |
| Weight of + #10 Before Washing (g) | 530.91 |
| Weight of + #10 After Washing (g) | 507.08 |
| Weight of - #10 Wet (g) | 567.87 |
| Weight of - #10 Dry (g) | 585.94 |
| Wt. Total Sample Dry (g) | 1093.02 |
| Calc. Wt. "W" (g) | 132.39 |
| Calc. Mass + #10 | 61.42 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 13.47 | 13.47 | 13.47 | 1.2 | 98.8 |
| 3/8" | 0.00 | 124.78 | 124.78 | 138.25 | 12.6 | 87.4 |
| #4 | 0.00 | 202.57 | 202.57 | 340.82 | 31.2 | 68.8 |
| #10 | 0.00 | 166.26 | 166.26 | 507.08 | 46.4 | 53.6 |
| #20 | 3.05 | 16.65 | 13.59 | 13.59 | 56.7 | 43.3 |
| #40 | 3.19 | 20.53 | 17.33 | 30.92 | 69.8 | 30.2 |
| #60 | 2.99 | 13.21 | 10.22 | 41.14 | 77.5 | 22.5 |
| #100 | 3.05 | 7.42 | 4.37 | 45.52 | 80.8 | 19.2 |
| #200 | 3.24 | 6.24 | 3.00 | 48.51 | 83.0 | 17.0 |

Data entered by: MLM Date: 11/07/2012
Data checked by: SKL Date: 11/7/12
FileName: LKHY04Z2

ADVANCED TERRA TESTING, Inc. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-6

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 21.1-23.5' | DATE TESTED | 11/5/12 SKL |
| SAMPLE NO. | 211B004GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

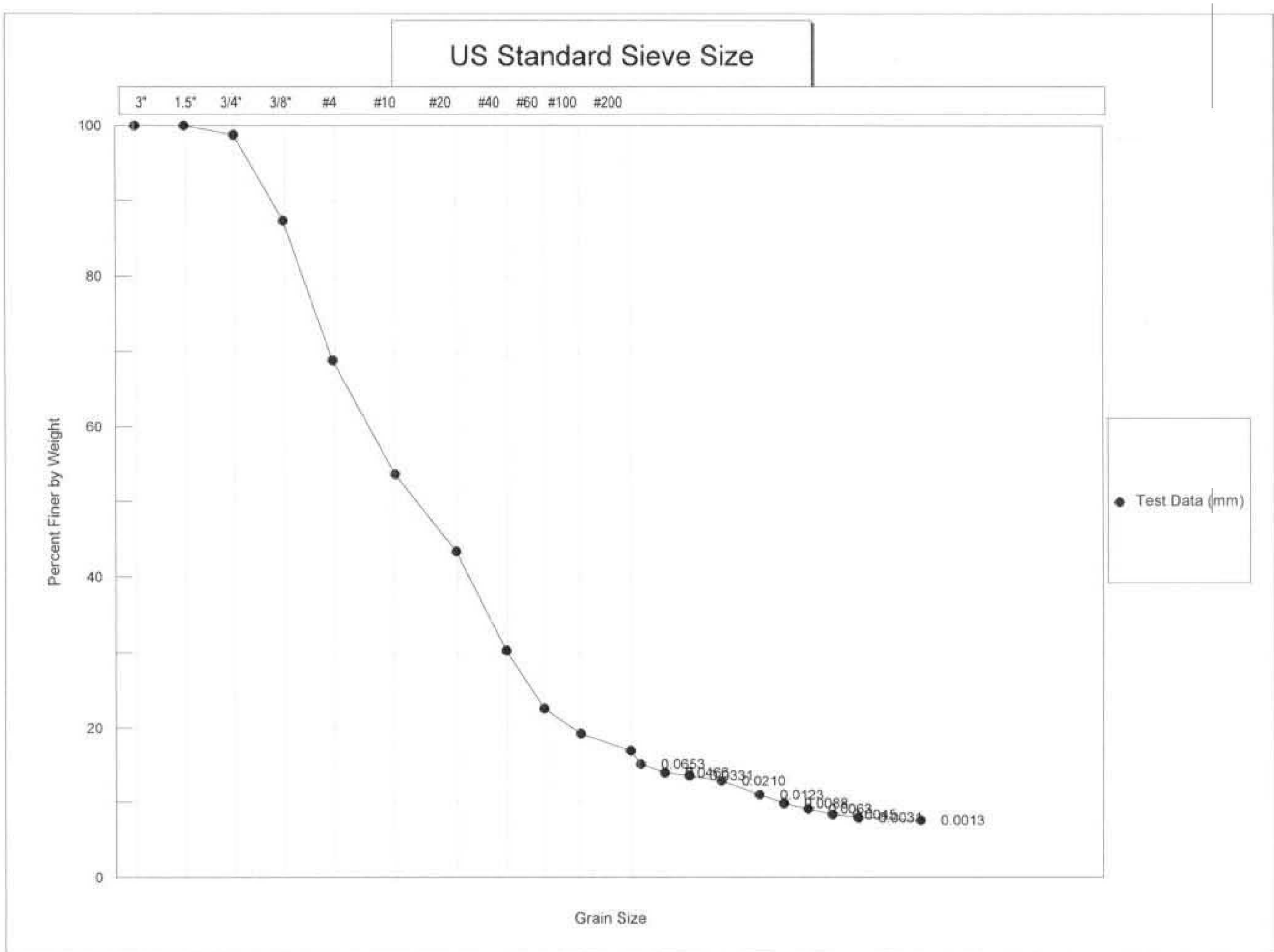
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.7 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01322 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 132.394 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | 25.00 | 20.00 | 15.1 | 15.1 | 12.19 | 0.0653 |
| 1.0 | 23.50 | 18.50 | 14.0 | 14.0 | 12.44 | 0.0466 |
| 2.0 | 23.00 | 18.00 | 13.6 | 13.6 | 12.52 | 0.0331 |
| 5.0 | 22.00 | 17.00 | 12.8 | 12.8 | 12.68 | 0.0210 |
| 15.0 | 19.50 | 14.50 | 11.0 | 11.0 | 13.09 | 0.0123 |
| 30.0 | 18.00 | 13.00 | 9.8 | 9.8 | 13.34 | 0.0088 |
| 60.0 | 17.00 | 12.00 | 9.1 | 9.1 | 13.50 | 0.0063 |
| 120.0 | 16.00 | 11.00 | 8.3 | 8.3 | 13.67 | 0.0045 |
| 250.0 | 15.50 | 10.50 | 7.9 | 7.9 | 13.75 | 0.0031 |
| 1440.0 | 15.00 | 10.00 | 7.6 | 7.6 | 13.83 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/07/2012
Data checked by: [signature] Date: 11/7/12
FileName: LKHY04Z2

ADVANCED TERRA TESTING, Inc. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-B-004 Sample No.: 211B004GRNSZ2
Job Number: 2855-6 Depth: 21.1-23.5'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 36-38' | DATE TESTED | 11/5/12 SKL |
| SAMPLE NO. | 211B004GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 78.44 |
| Wt. Dry Soil & Pan (g) | 77.30 |
| Wt. Lost Moisture (g) | 1.14 |
| Wt. of Pan Only (g) | 3.07 |
| Wt. of Dry Soil (g) | 74.23 |
| Moisture Content % | 1.5 |
| Wt. Hydrom. Sample Wet (g) | 62.93 |
| Wt. Hydrom. Sample Dry (g) | 61.98 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1104.43 |
| Weight of + #10 Before Washing (g) | 3.63 |
| Weight of + #10 After Washing (g) | 3.41 |
| Weight of - #10 Wet (g) | 1100.80 |
| Weight of - #10 Dry (g) | 1084.37 |
| Wt. Total Sample Dry (g) | 1087.78 |
| Calc. Wt. "W" (g) | 62.18 |
| Calc. Mass + #10 | 0.19 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 1.45 | 1.45 | 1.45 | 0.1 | 99.9 |
| #10 | 0.00 | 1.96 | 1.96 | 3.41 | 0.3 | 99.7 |
| #20 | 2.99 | 3.32 | 0.33 | 0.33 | 0.8 | 99.2 |
| #40 | 3.01 | 4.82 | 1.81 | 2.14 | 3.8 | 96.2 |
| #60 | 3.10 | 7.97 | 4.87 | 7.01 | 11.6 | 88.4 |
| #100 | 2.98 | 9.11 | 6.12 | 13.13 | 21.4 | 78.6 |
| #200 | 2.97 | 7.89 | 4.91 | 18.04 | 29.3 | 70.7 |

Data entered by: MLM Date: 11/07/2012
Data checked by: SKL Date: 11/7/12
FileName: LKHY04Z3

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

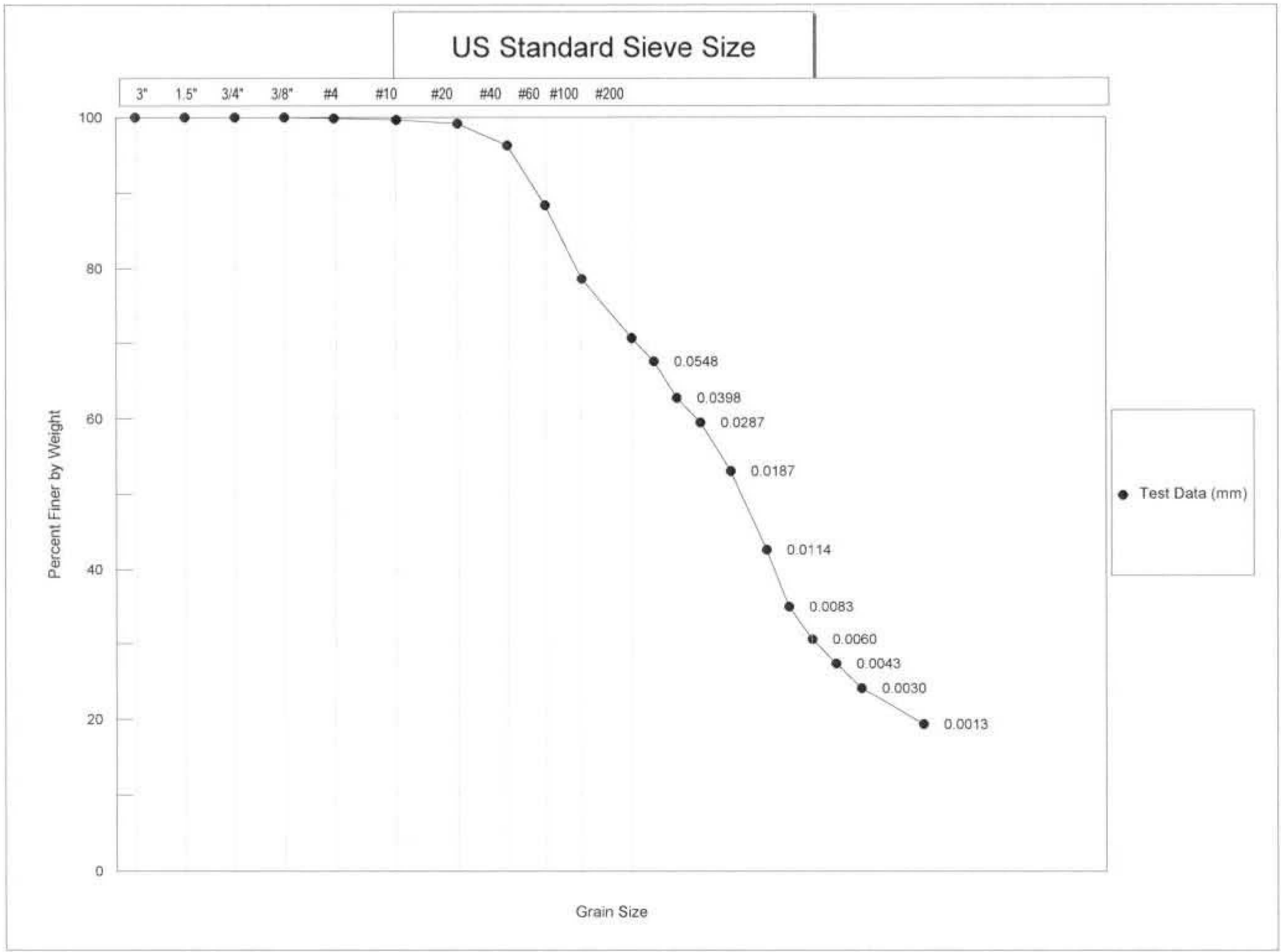
| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 36-38' | DATE TESTED | 11/5/12 SKL |
| SAMPLE NO. | 211B004GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.7 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01322 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 62.176 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | 47.00 | 42.00 | 67.6 | 67.6 | 8.58 | 0.0548 |
| 1.0 | 44.00 | 39.00 | 62.7 | 62.7 | 9.07 | 0.0398 |
| 2.0 | 42.00 | 37.00 | 59.5 | 59.5 | 9.40 | 0.0287 |
| 5.0 | 38.00 | 33.00 | 53.1 | 53.1 | 10.06 | 0.0187 |
| 15.0 | 31.50 | 26.50 | 42.6 | 42.6 | 11.12 | 0.0114 |
| 30.0 | 26.75 | 21.75 | 35.0 | 35.0 | 11.90 | 0.0083 |
| 60.0 | 24.00 | 19.00 | 30.6 | 30.6 | 12.35 | 0.0060 |
| 120.0 | 22.00 | 17.00 | 27.3 | 27.3 | 12.68 | 0.0043 |
| 250.0 | 20.00 | 15.00 | 24.1 | 24.1 | 13.01 | 0.0030 |
| 1440.0 | 17.00 | 12.00 | 19.3 | 19.3 | 13.50 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/07/2012
Data checked by:______ Date:________
FileName: LKHY04Z3




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky   Boring No.: 211-B-004   Sample No.: 211B004GRNSZ3

Job Number: 2855-6   Depth: 36-38'

Classification: **Classification Not Performed**

F-102

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-6

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-001 | SAMPLED | 10/9/12 MK |
| DEPTH | 8.0-10.0' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B001GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 36.85 |
| Wt. Dry Soil & Pan (g) | | 36.27 |
| Wt. Lost Moisture (g) | | 0.58 |
| Wt. of Pan Only (g) | | 3.02 |
| Wt. of Dry Soil (g) | | 33.25 |
| Moisture Content % | | 1.7 |
| Wt. Hydrom. Sample Wet (g) | | 69.89 |
| Wt. Hydrom. Sample Dry (g) | | 68.69 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 103.70 |
| Weight of + #10 Before Washing (g) | 0.00 |
| Weight of + #10 After Washing (g) | 0.00 |
| Weight of - #10 Wet (g) | 103.70 |
| Weight of - #10 Dry (g) | 101.92 |
| Wt. Total Sample Dry (g) | 101.92 |
| Calc. Wt. "W" (g) | 68.69 |
| Calc. Mass + #10 | 0.00 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #20 | 2.98 | 3.01 | 0.03 | 0.03 | 0.0 | 100.0 |
| #40 | 3.13 | 3.33 | 0.20 | 0.24 | 0.3 | 99.7 |
| #60 | 3.04 | 3.97 | 0.93 | 1.16 | 1.7 | 98.3 |
| #100 | 2.98 | 4.62 | 1.64 | 2.80 | 4.1 | 95.9 |
| #200 | 3.04 | 4.07 | 1.03 | 3.83 | 5.6 | 94.4 |

Data entered by: MLM Date: 11/12/2012
Data checked by: [signature] Date: 11/12/12
FileName: LKHY01Z1

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-001 | SAMPLED | 10/9/12 MK |
| DEPTH | 8.0-10.0' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B001GRNSZ1 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

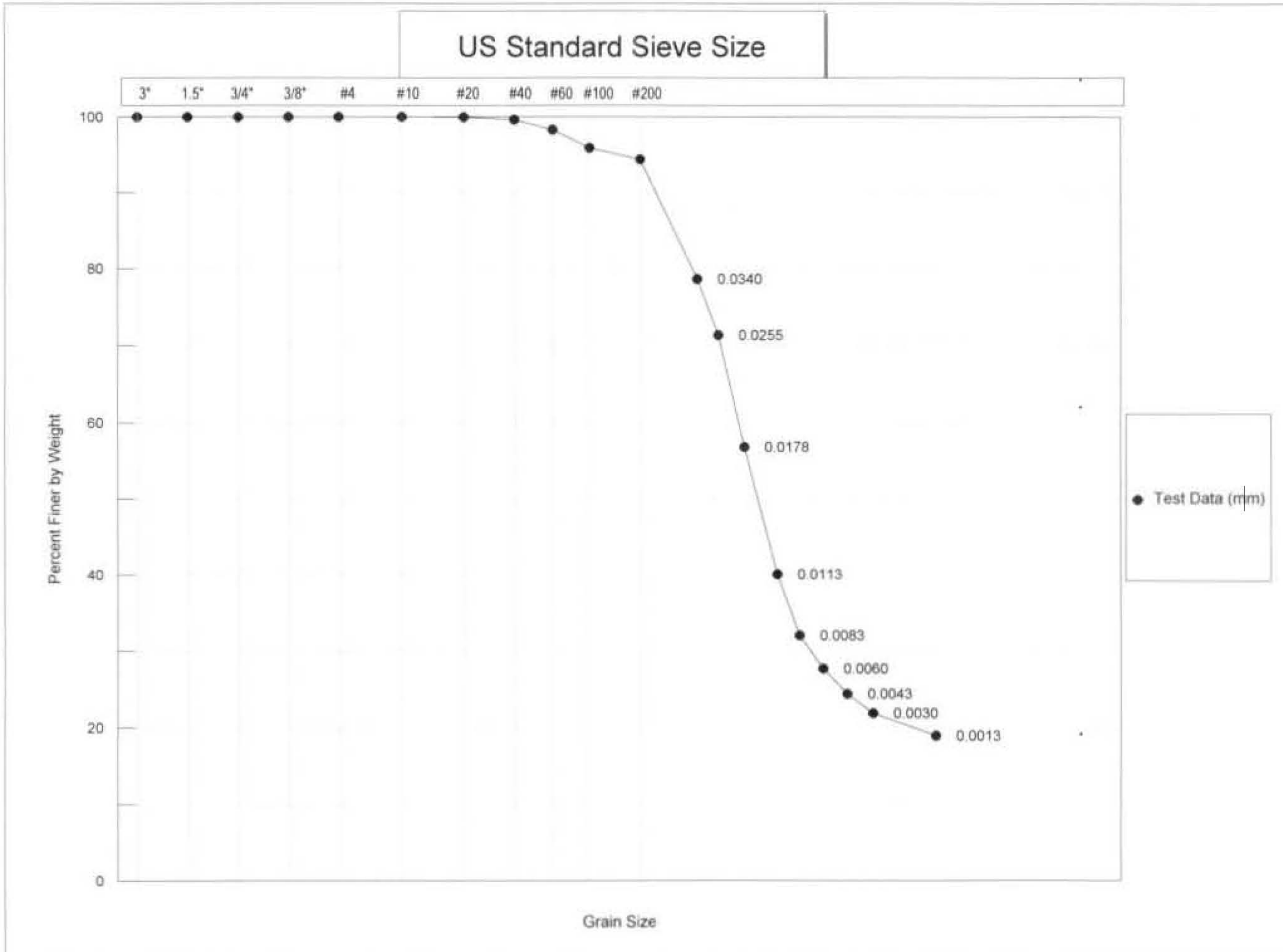
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.7 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01322 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 68.687 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 59.00 | 54.00 | 78.6 | 78.6 | 6.61 | 0.0340 |
| 2.0 | 54.00 | 49.00 | 71.3 | 71.3 | 7.43 | 0.0255 |
| 5.0 | 44.00 | 39.00 | 56.8 | 56.8 | 9.07 | 0.0178 |
| 15.0 | 32.50 | 27.50 | 40.0 | 40.0 | 10.96 | 0.0113 |
| 30.0 | 27.00 | 22.00 | 32.0 | 32.0 | 11.86 | 0.0083 |
| 60.0 | 24.00 | 19.00 | 27.7 | 27.7 | 12.35 | 0.0060 |
| 120.0 | 21.75 | 16.75 | 24.4 | 24.4 | 12.72 | 0.0043 |
| 250.0 | 20.00 | 15.00 | 21.8 | 21.8 | 13.01 | 0.0030 |
| 1440.0 | 18.00 | 13.00 | 18.9 | 18.9 | 13.34 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/12/2012
Data checked by: CH Date: 11/12/12
FileName: LKHY01Z1

ADVANCED TERRA TESTING, INC.




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky  Boring No.: 211-B-001  Sample No.: 211B001GRNSZ1
Job Number: 2855-6  Depth: 8.0-10.0'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-6

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-001 | SAMPLED | 10/9/12 MK |
| DEPTH | 18.0-20.0' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B001GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | |
|---|---|
| HYGROSCOPIC | Yes |
| NATURAL | No |
| Wt. Wet Soil & Pan (g) | 35.10 |
| Wt. Dry Soil & Pan (g) | 34.56 |
| Wt. Lost Moisture (g) | 0.54 |
| Wt. of Pan Only (g) | 3.00 |
| Wt. of Dry Soil (g) | 31.56 |
| Moisture Content % | 1.7 |
| Wt. Hydrom. Sample Wet (g) | 90.81 |
| Wt. Hydrom. Sample Dry (g) | 89.29 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1093.47 |
| Weight of + #10 Before Washing (g) | 545.18 |
| Weight of + #10 After Washing (g) | 493.40 |
| Weight of - #10 Wet (g) | 548.29 |
| Weight of - #10 Dry (g) | 589.98 |
| Wt. Total Sample Dry (g) | 1083.38 |
| Calc. Wt. "W" (g) | 163.96 |
| Calc. Mass + #10 | 74.67 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 24.39 | 24.39 | 24.39 | 2.3 | 97.7 |
| 3/8" | 0.00 | 170.78 | 170.78 | 195.17 | 18.0 | 82.0 |
| #4 | 0.00 | 176.89 | 176.89 | 372.06 | 34.3 | 65.7 |
| #10 | 0.00 | 121.34 | 121.34 | 493.40 | 45.5 | 54.5 |
| #20 | 3.21 | 15.52 | 12.31 | 12.31 | 53.0 | 47.0 |
| #40 | 3.04 | 18.65 | 15.60 | 27.91 | 62.6 | 37.4 |
| #60 | 3.04 | 16.91 | 13.87 | 41.78 | 71.0 | 29.0 |
| #100 | 3.03 | 8.86 | 5.83 | 47.61 | 74.6 | 25.4 |
| #200 | 3.00 | 5.70 | 2.70 | 50.31 | 76.2 | 23.8 |

Data entered by: MLM Date: 11/12/2012
Data checked by: Date: 11/12/12
FileName: LKHY01Z2

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-001 | SAMPLED | 10/9/12 MK |
| DEPTH | 18.0-20.0' | DATE TESTED | 11/8/12 SKL |
| SAMPLE NO. | 211B001GRNSZ2 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

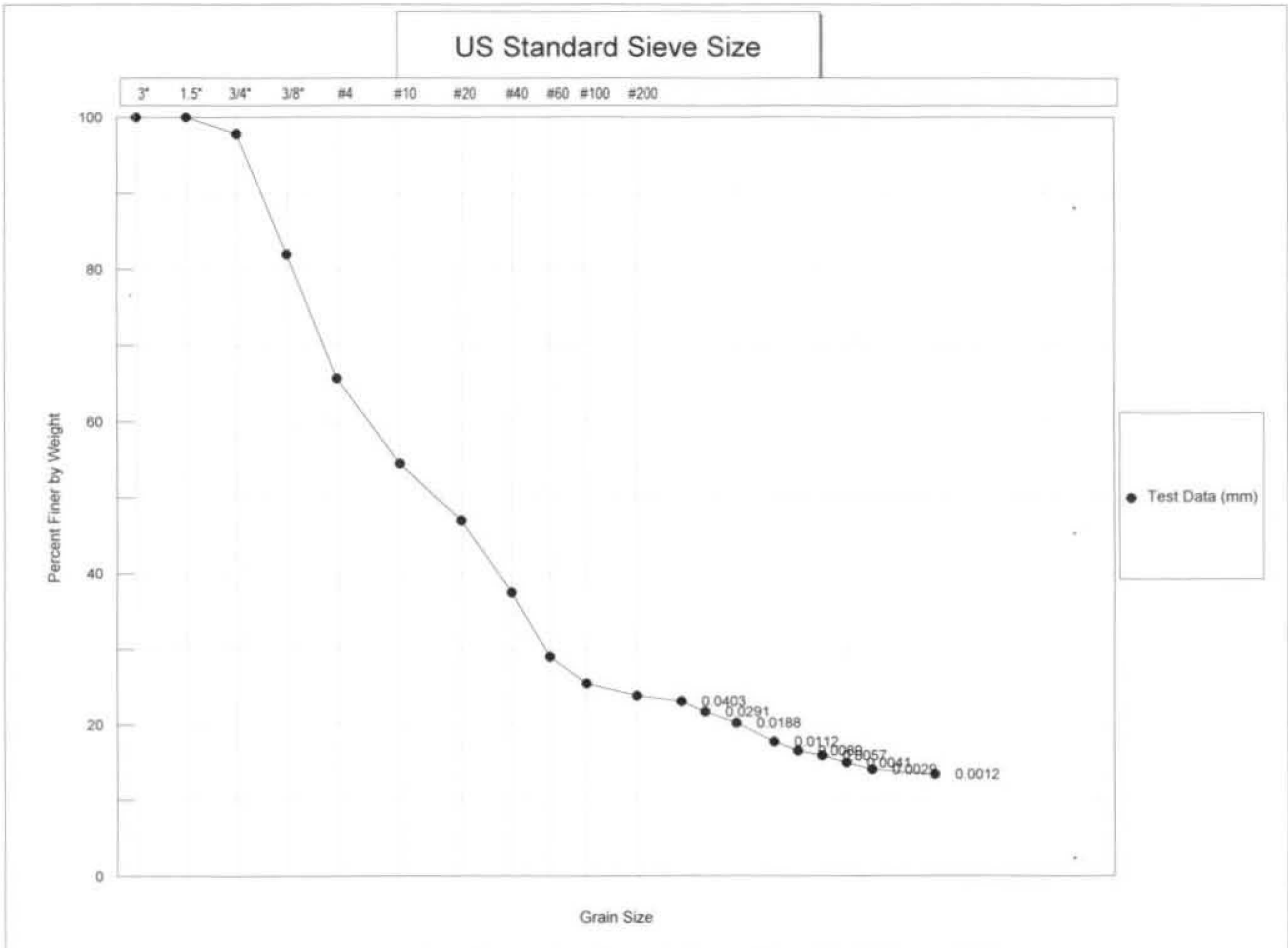
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.6 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01323 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 163.957 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | -- | -- | -- | -- | -- | -- |
| 1.0 | 42.75 | 37.75 | 23.0 | 23.0 | 9.28 | 0.0403 |
| 2.0 | 40.50 | 35.50 | 21.7 | 21.7 | 9.65 | 0.0291 |
| 5.0 | 38.00 | 33.00 | 20.1 | 20.1 | 10.06 | 0.0188 |
| 15.0 | 34.00 | 29.00 | 17.7 | 17.7 | 10.71 | 0.0112 |
| 30.0 | 32.00 | 27.00 | 16.5 | 16.5 | 11.04 | 0.0080 |
| 60.0 | 31.00 | 26.00 | 15.9 | 15.9 | 11.21 | 0.0057 |
| 120.0 | 29.50 | 24.50 | 14.9 | 14.9 | 11.45 | 0.0041 |
| 250.0 | 28.00 | 23.00 | 14.0 | 14.0 | 11.70 | 0.0029 |
| 1440.0 | 27.00 | 22.00 | 13.4 | 13.4 | 11.86 | 0.0012 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/12/2012
Data checked by: [signature] Date: 11/12/12
FileName: LKHY01Z2

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-B-001 Sample No.: 211B001GRNSZ2
Job Number: 2855-6 Depth: 18.0-20.0'
Classification: **Classification Not Performed**

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT LATA Kentucky

JOB NO. 2855-6

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-001 | SAMPLED | 10/9/12 MK |
| DEPTH | 38.0-40.0' | DATE TESTED | 11/5/12 SKL |
| SAMPLE NO. | 211B001GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

MOISTURE DATA

| | | |
|---|---|---|
| HYGROSCOPIC | Yes | |
| NATURAL | No | |
| Wt. Wet Soil & Pan (g) | | 58.82 |
| Wt. Dry Soil & Pan (g) | | 58.15 |
| Wt. Lost Moisture (g) | | 0.67 |
| Wt. of Pan Only (g) | | 3.07 |
| Wt. of Dry Soil (g) | | 55.08 |
| Moisture Content % | | 1.2 |
| Wt. Hydrom. Sample Wet (g) | | 64.25 |
| Wt. Hydrom. Sample Dry (g) | | 63.48 |

WASH SIEVE ANALYSIS

| | |
|---|---|
| Wt. Total Sample Wet (g) | 1383.18 |
| Weight of + #10 Before Washing (g) | 18.17 |
| Weight of + #10 After Washing (g) | 16.14 |
| Weight of - #10 Wet (g) | 1365.01 |
| Weight of - #10 Dry (g) | 1350.61 |
| Wt. Total Sample Dry (g) | 1366.75 |
| Calc. Wt. "W" (g) | 64.24 |
| Calc. Mass + #10 | 0.76 |

| Sieve Number (Size) | Pan Weight (g) | Indiv. Wt. + Pan (g) | Indiv. Wt. Retain. | Cum. Wt. Retain. | Cum. % Retain. | % Finer By Wt. |
|---|---|---|---|---|---|---|
| 3" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 1 1/2" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/4" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| 3/8" | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 100.0 |
| #4 | 0.00 | 7.63 | 7.63 | 7.63 | 0.6 | 99.4 |
| #10 | 0.00 | 8.51 | 8.51 | 16.14 | 1.2 | 98.8 |
| #20 | 3.08 | 3.85 | 0.77 | 0.77 | 2.4 | 97.6 |
| #40 | 3.05 | 6.59 | 3.54 | 4.31 | 7.9 | 92.1 |
| #60 | 3.02 | 9.23 | 6.21 | 10.52 | 17.6 | 82.4 |
| #100 | 3.02 | 12.10 | 9.09 | 19.61 | 31.7 | 68.3 |
| #200 | 3.08 | 10.36 | 7.29 | 26.89 | 43.0 | 57.0 |

Data entered by: MLM Date: 11/07/2012
Data checked by: Date: 11/7/12
FileName: LKHY01Z3

ADVANCED TERRA TESTING, INC. ATT

HYDROMETER ANALYSIS - SEDIMENTATION DATA
ASTM D 422

| | | | |
|---|---|---|---|
| CLIENT | LATA Kentucky | JOB NO. | 2855-6 |
| BORING NO. | 211-B-001 | SAMPLED | 10/9/12 MK |
| DEPTH | 38.0-40.0' | DATE TESTED | 11/5/12 SKL |
| SAMPLE NO. | 211B001GRNSZ3 | WASH SIEVE | Yes |
| SOIL DESCR. | ERI12-SW-SWMU211B | DRY SIEVE | No |
| LOCATION | SW Plume RDSI Geotechnical | | |

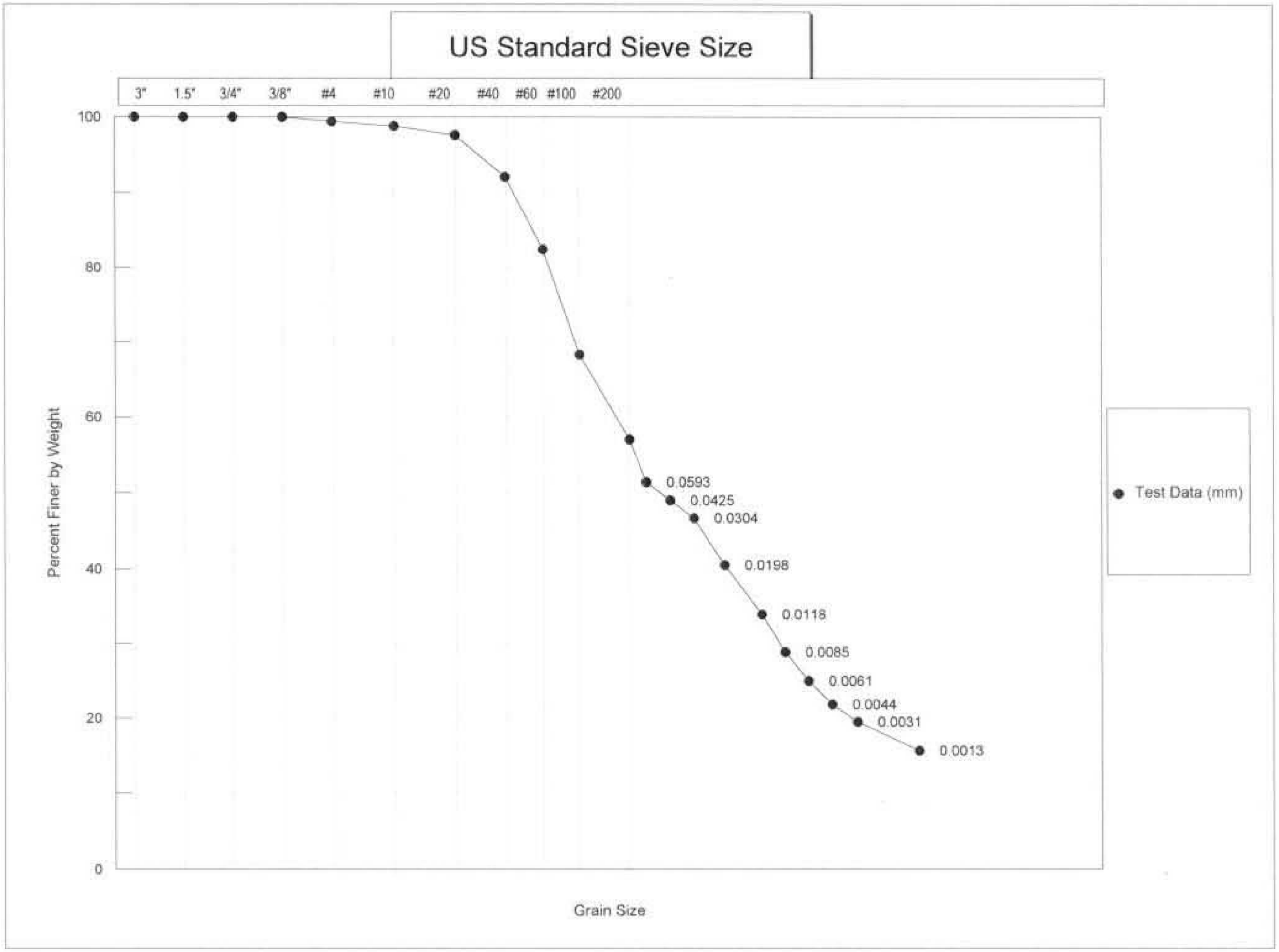
| | | | |
|---|---|---|---|
| Hydrometer # | ASTM 152 H | Temp., Deg. C | 22.6 |
| Sp. Gr. of Soil | 2.65 | Temp. Coef. K | 0.01323 |
| Value of "alpha" | 1.00 | Wt. Dry Sample "W" | 64.239 |
| Deflocculant | Sodium Hexametaphosphate | % of Total Sample | 100.0 |
| Defloc. Corr'n | 5.0 | | |
| Meniscus Corr'n | 0.0 | | |

| T Elapsed Time (min) | Hydrometer Reading Original | Corrected "R" | 100Ra/W | % Total Sample | Effective Depth L | Grain Diameter (mm) |
|---|---|---|---|---|---|---|
| 0.0 | -- | -- | -- | -- | -- | -- |
| 0.5 | 38.00 | 33.00 | 51.4 | 51.4 | 10.06 | 0.0593 |
| 1.0 | 36.50 | 31.50 | 49.0 | 49.0 | 10.30 | 0.0425 |
| 2.0 | 35.00 | 30.00 | 46.7 | 46.7 | 10.55 | 0.0304 |
| 5.0 | 31.00 | 26.00 | 40.5 | 40.5 | 11.21 | 0.0198 |
| 15.0 | 26.75 | 21.75 | 33.9 | 33.9 | 11.90 | 0.0118 |
| 30.0 | 23.50 | 18.50 | 28.8 | 28.8 | 12.44 | 0.0085 |
| 60.0 | 21.00 | 16.00 | 24.9 | 24.9 | 12.85 | 0.0061 |
| 120.0 | 19.00 | 14.00 | 21.8 | 21.8 | 13.17 | 0.0044 |
| 250.0 | 17.50 | 12.50 | 19.5 | 19.5 | 13.42 | 0.0031 |
| 1440.0 | 15.00 | 10.00 | 15.6 | 15.6 | 13.83 | 0.0013 |

Grain Diameter = K*(SQRT(L/T))

Data entered by: MLM Date: 11/07/2012
Data checked by: [signature] Date: 11/7/12
FileName: LKHY01Z3

ADVANCED TERRA TESTING, INC. ATT




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY (mm) | USCS |
|---|---|---|---|---|---|---|---|
| | COARSE | FINE | CRS | MEDIUM | FINE | | |

| COBBLES TO BOULDERS | PEBBLE GRAVEL | | | | SAND | | | SILT | CLAY | WENTWORTH |
|---|---|---|---|---|---|---|---|---|---|---|
| | COARSE | MED | FINE | GRAN | COARSE | MED | FINE | | | |

Client: LATA Kentucky Boring No.: 211-B-001 Sample No.: 211B001GRNSZ3

Job Number: 2855-6 Depth: 38.0-40.0'

Classification: **Classification Not Performed**

Permeability Tests

ASTM D5084-10

Advanced Terra Testing

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of Ky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-001 | SAMPLED | 10/09/12 KD |
| DEPTH | 32.0-37.0' C | TEST STARTED | 11/21/12 CAL |
| SAMPLE NO. | 211B001PERM3 | TEST FINISHED | 12/02/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | CELL NUMBER | 7P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 4658 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 211.1 | 206.3 |
| Wt. Wet Soil & Pan (g) | 217.6 | 212.8 |
| Wt. Dry Soil & Pan (g) | 182.3 | 182.3 |
| Wt. Lost Moisture (g) | 35.3 | 30.5 |
| Wt. of Pan Only (g) | 6.5 | 6.5 |
| Wt. of Dry Soil (g) | 175.8 | 175.8 |
| Moisture Content % | 20.1 | 17.4 |
| Wet Density PCF | 130.2 | 136.9 |
| Dry Density PCF | 108.4 | 116.6 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.613 | (cm) | 4.097 |
| Init. Area (sq in) | 2.043 | (sq cm) | 13.184 |
| Init. Height (in) | 3.022 | (cm) | 7.676 |
| Vol. Bef. Consol. (cu ft) | 0.00357 | | |
| Vol. After Consol. (cu ft) | 0.00332 | | |
| Porosity % | 32.41 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 2.984 |
| Diameter | 1.565 |
| Pressure (psi) | 4.740 |
| Area after consol. (cm*cm) | 12.415 |
| Gradient | 43.969 |
| Permeability k (cm/s) | 1.9E-09 |
| **Permeability k (m/s)** | **1.9E-11** |
| Back Pressure (psi) | 68.0 |
| Cell Pressure (psi) | 100.3 |
| Ave. Effective Stress (psi) | 29.930 |

Average temperature degree C: 22.4

Data entry by: MLM Date: 12/04/2012
Checked by: cyc Date: 12/4/12
FileName: LKP00013

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of Ky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-001 | SAMPLED | 10/09/12 KD |
| DEPTH | 32.0-37.0' C | TEST STARTED | 11/21/12 CAL |
| SAMPLE NO. | 211B001PERM3 | TEST FINISHED | 12/02/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | SETUP NO. | 7P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 4658 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 1.5 | 10.2 | | | | |
| 50.0 | 48.0 | 14.4 | 15.4 | 38.5 | 47.8 | 9.3 | 0.93 |
| 60.0 | 58.0 | 16.2 | 17.1 | 48.5 | 57.9 | 9.4 | 0.94 |
| 70.0 | 68.0 | 17.3 | 18.2 | 58.5 | 67.8 | 9.3 | 0.93 |
| 80.0 | | 18.9 | 18.9 | 68.1 | 77.9 | 9.8 | 0.98 |

CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.30 | 0.00 |
| 0.25 | 0.50 | 3.00 | -2.70 |
| 0.5 | 0.71 | 3.10 | -2.80 |
| 1 | 1.00 | 3.15 | -2.85 |
| 2 | 1.41 | 3.20 | -2.90 |
| 4 | 2.00 | 3.30 | -3.00 |
| 9 | 3.00 | 3.50 | -3.20 |
| 16 | 4.00 | 3.70 | -3.40 |
| 30 | 5.48 | 3.90 | -3.60 |
| 60 | 7.75 | 4.50 | -4.20 |
| 138 | 11.75 | 5.30 | -5.00 |
| 240 | 15.49 | 6.10 | -5.80 |
| 360 | 18.97 | 6.80 | -6.50 |

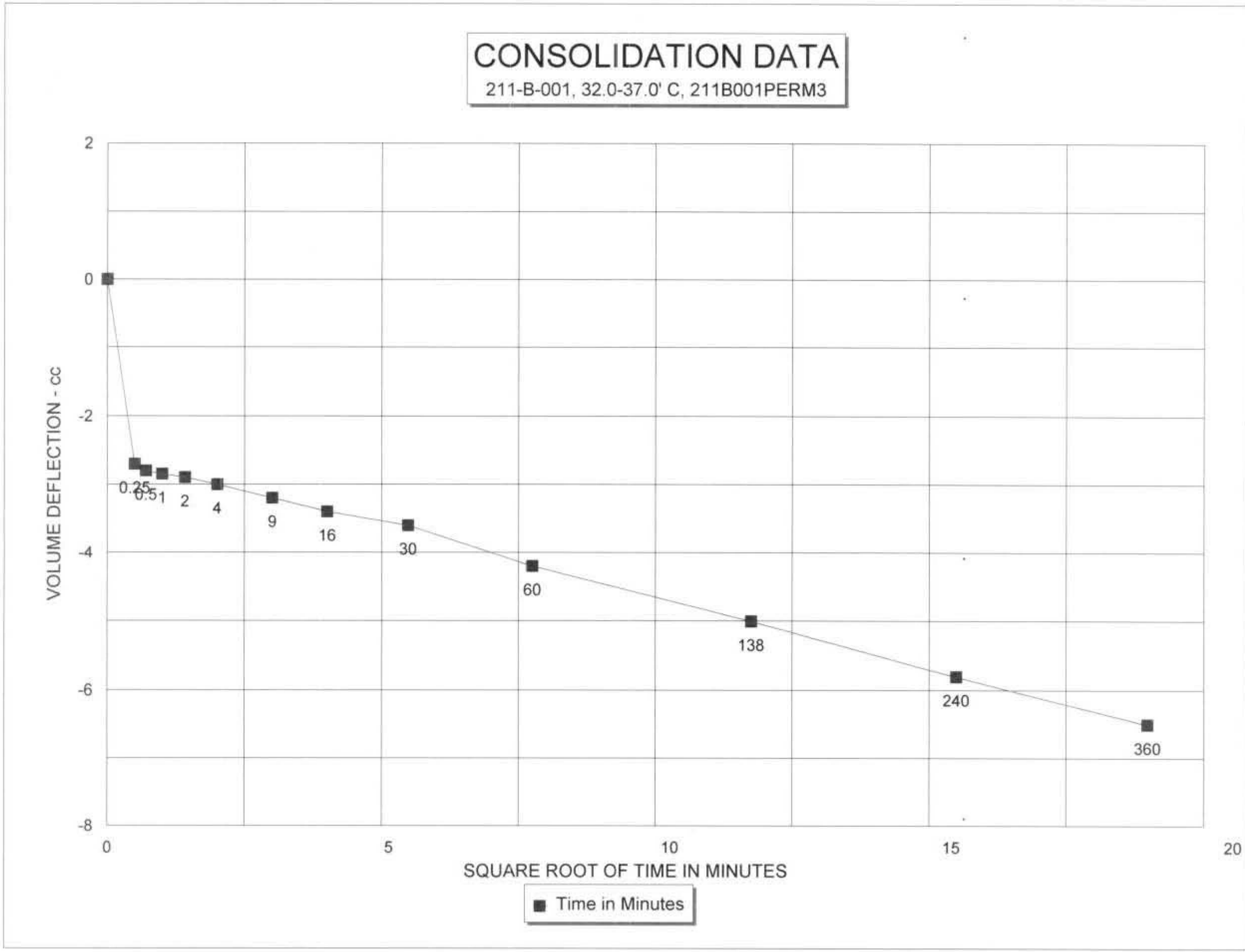
| | | | |
|---|---|---|---|
| Initial Height (in) | 3.022 | Init. Vol. (CC) | 101.21 |
| Height Change (in) | 0.038 | Vol. Change (CC) | 29.90 |
| Ht. After Cons. (in) | 2.984 | Cell Exp. (CC) | 22.80 |
| Initial Area (sq in) | 2.043 | Net Change (CC) | 7.10 |
| Area After Cons. (sq in) | 1.924 | Cons. Vol. (CC) | 94.11 |

Data entry by: MLM Date: 12/04/2012

Checked by: CK Date: 12/4/12

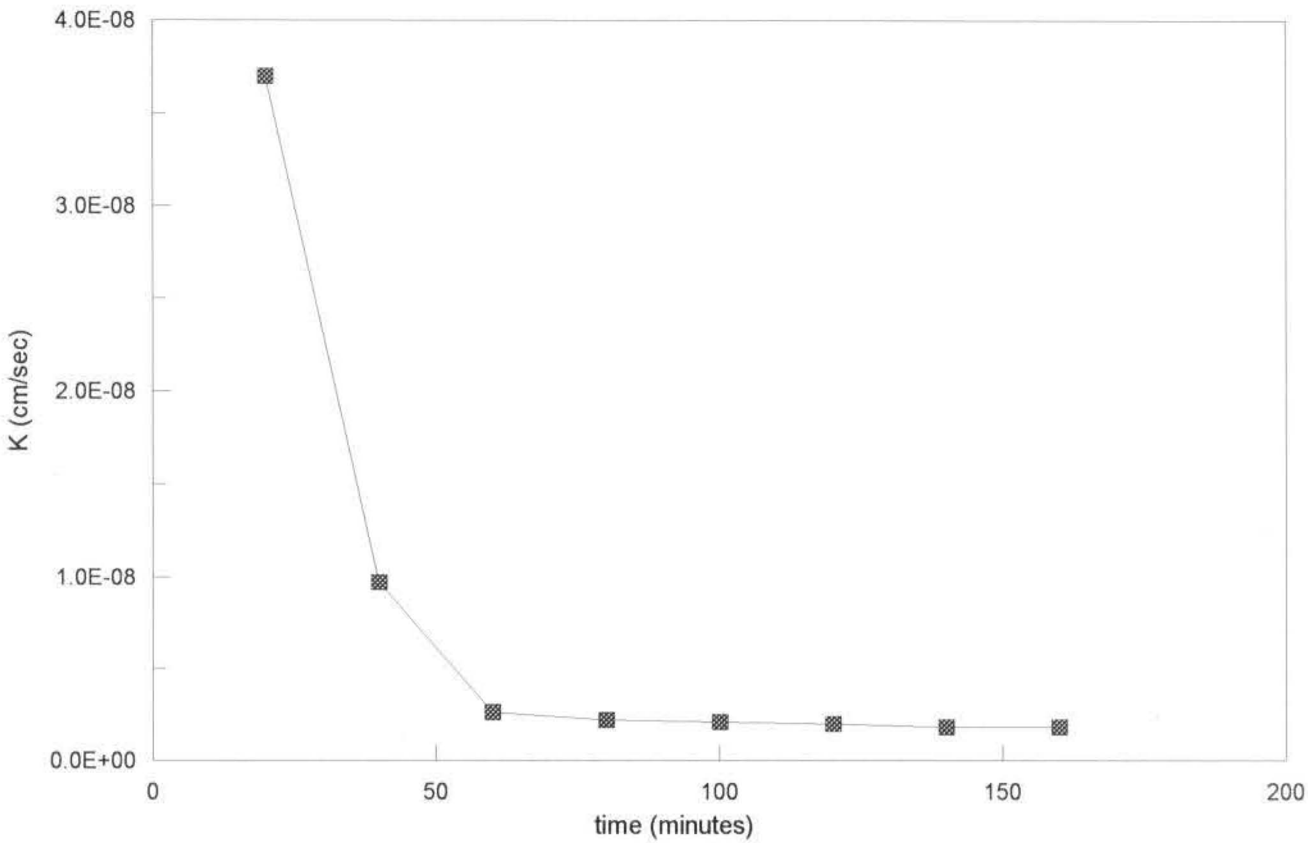
FileName: LKP00013

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
211-B-001, 32.0-37.0' C, 211B001PERM3
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
2
0
-2
-4
-6
-8
0
5
10
15
20
0.25
0.5
1
2
4
9
16
30
60
138
240
360

Preliminary Flow Pump Data

LATA-KY, SW Plume Geotech, 211B001PERM3




Average last 4 values
1.9E-09

Data Entered By: CAL

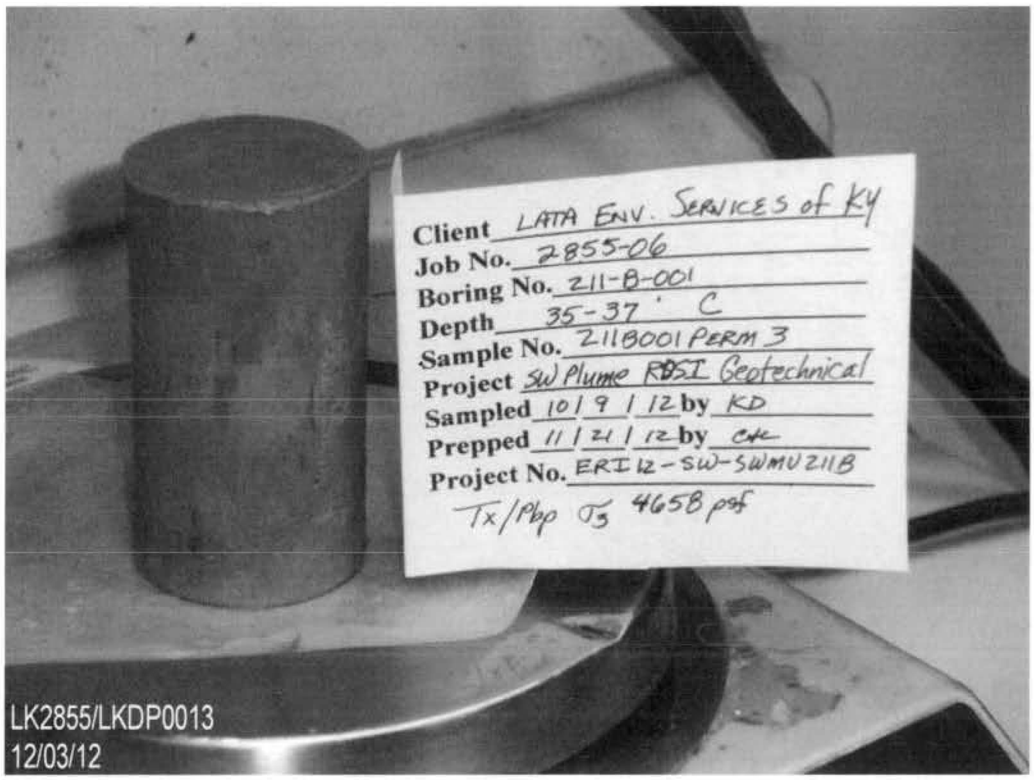
Data Checked By: JM

File Name: LKFP0013

Date: 12/02/2012

Date Checked 12/3/12

ADVANCED TERRA TESTING, INC. ATT


Client LATA ENV. SERVICES of KY
Job No. 2855-06
Boring No. 211-B-001
Depth 35-37' C
Sample No. 211B001 PERM 3
Project SW Plume RDSI Geotechnical
Sampled 10/9/12 by KD
Prepped 11/21/12 by
Project No. ERI 12-SW-SWMU211B
Tx/Pbp σ3 4658 psf
LK2855/LKDP0013
12/03/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of KY | JOB NO. | 2855-06 |
| BORING NO. | 211-B-001 | SAMPLED | 10/09/12 KD |
| DEPTH | 5.0-7.0' B | TEST STARTED | 11/14/12 CAL |
| SAMPLE NO. | 211B001PERM1 | TEST FINISHED | 11/28/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | CELL NUMBER | 9P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 776 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 229.1 | 229.1 |
| Wt. Wet Soil & Pan (g) | 235.6 | 235.6 |
| Wt. Dry Soil & Pan (g) | 194.8 | 194.8 |
| Wt. Lost Moisture (g) | 40.8 | 40.8 |
| Wt. of Pan Only (g) | 6.5 | 6.5 |
| Wt. of Dry Soil (g) | 188.3 | 188.3 |
| Moisture Content % | 21.7 | 21.7 |
| Wet Density PCF | 127.6 | 124.2 |
| Dry Density PCF | 104.8 | 102.1 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.654 | (cm) | 4.201 |
| Init. Area (sq in) | 2.149 | (sq cm) | 13.863 |
| Init. Height (in) | 3.184 | (cm) | 8.087 |
| Vol. Bef. Consol. (cu ft) | 0.00396 | | |
| Vol. After Consol. (cu ft) | 0.00407 | | |
| Porosity % | 35.47 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 25 |
| Velocity CM/Sec | 1.64E-04 |
| Q (cc/s) | 5.25E-06 |
| Height | 3.163 |
| Diameter | 1.682 |
| Pressure (psi) | 1.160 |
| Area after consol. (cm*cm) | 14.333 |
| Gradient | 10.151 |
| Permeability k (cm/s) | 3.6E-08 |
| **Permeability k (m/s)** | **3.6E-10** |
| Back Pressure (psi) | 98.0 |
| Cell Pressure (psi) | 103.4 |
| Ave. Effective Stress (psi) | 4.820 |

Average temperature degree C: 22.5

Data entry by: DAW Date: 11/29/2012
Checked by: CAL Date: 11/30/12
FileName: LKP00011

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of KY | JOB NO. | 2855-06 |
| BORING NO. | 211-B-001 | SAMPLED | 10/09/12 KD |
| DEPTH | 5.0-7.0' B | TEST STARTED | 11/14/12 CAL |
| SAMPLE NO. | 211B001PERM1 | TEST FINISHED | 11/28/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | SETUP NO. | 9P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 776 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 4.1 | 9.3 | | | | |
| 50.0 | 48.0 | 9.8 | 11.0 | 38.7 | 47.0 | 8.3 | 0.83 |
| 60.0 | 58.0 | 11.0 | 11.9 | 48.8 | 57.1 | 8.3 | 0.83 |
| 70.0 | 68.0 | 12.0 | 12.9 | 58.6 | 67.1 | 8.5 | 0.85 |
| 80.0 | 78.0 | 13.6 | 14.4 | 68.7 | 77.6 | 8.9 | 0.89 |
| 90.0 | 88.0 | 14.7 | 15.5 | 78.7 | 88.0 | 9.3 | 0.93 |
| 100.0 | 98.0 | 15.4 | 16.2 | 88.7 | 97.9 | 9.2 | 0.92 |
| 110.0 | | 16.3 | 16.4 | 98.7 | 108.2 | 9.5 | 0.95 |

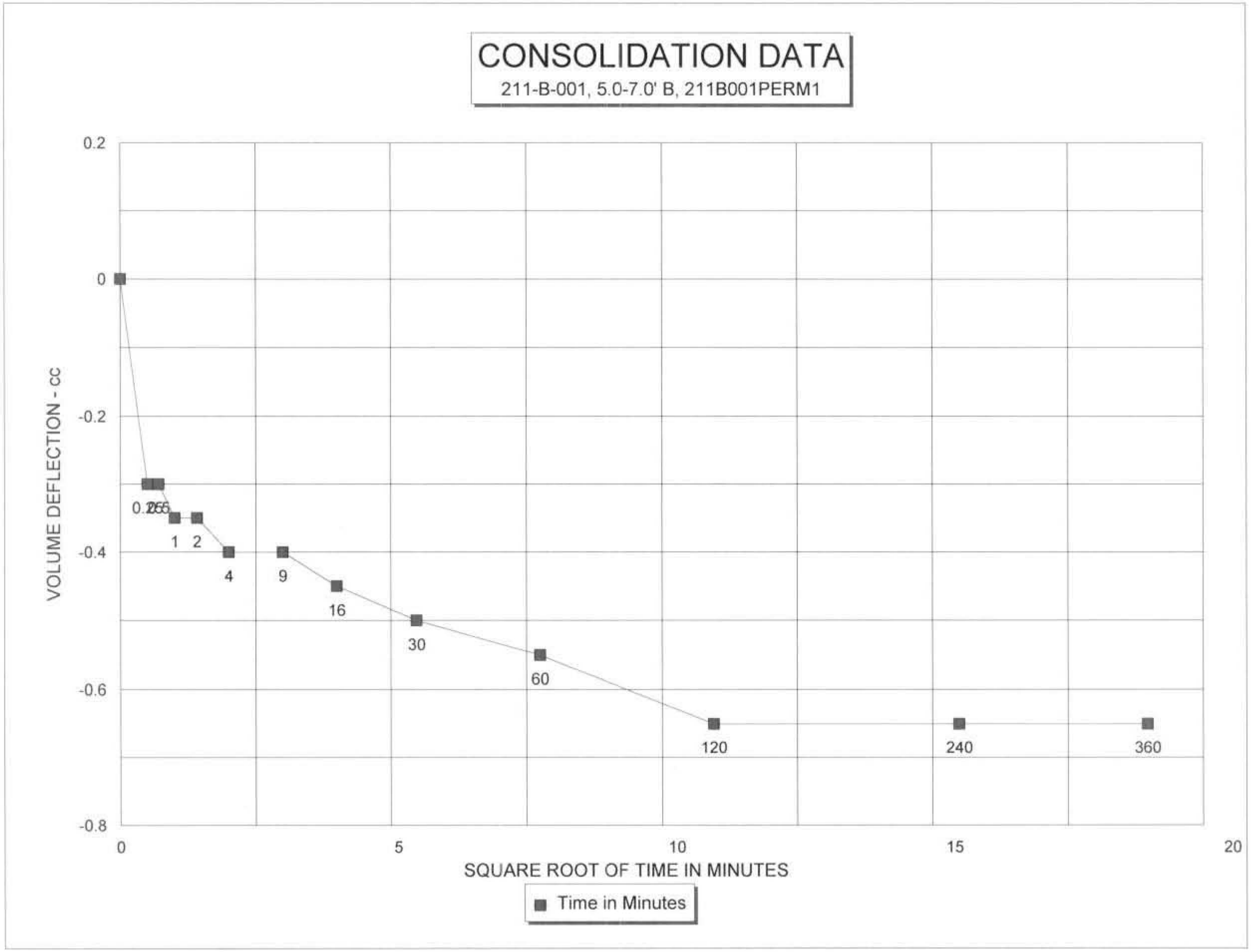
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 16.40 | 0.00 |
| 0.25 | 0.50 | 16.70 | -0.30 |
| 0.5 | 0.71 | 16.70 | -0.30 |
| 1 | 1.00 | 16.75 | -0.35 |
| 2 | 1.41 | 16.75 | -0.35 |
| 4 | 2.00 | 16.80 | -0.40 |
| 9 | 3.00 | 16.80 | -0.40 |
| 16 | 4.00 | 16.85 | -0.45 |
| 30 | 5.48 | 16.90 | -0.50 |
| 60 | 7.75 | 16.95 | -0.55 |
| 120 | 10.95 | 17.05 | -0.65 |
| 240 | 15.49 | 17.05 | -0.65 |
| 360 | 18.97 | 17.05 | -0.65 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.184 | Init. Vol. (CC) | 112.13 |
| Height Change (in) | 0.021 | Vol. Change (CC) | 13.10 |
| Ht. After Cons. (in) | 3.163 | Cell Exp. (CC) | 16.15 |
| Initial Area (sq in) | 2.149 | Net Change (CC) | -3.05 |
| Area After Cons. (sq in) | 2.222 | Cons. Vol. (CC) | 115.18 |

Data entry by: DAW Date: 11/29/2012
Checked by: CAL Date: 11/30/12
FileName: LKP00011

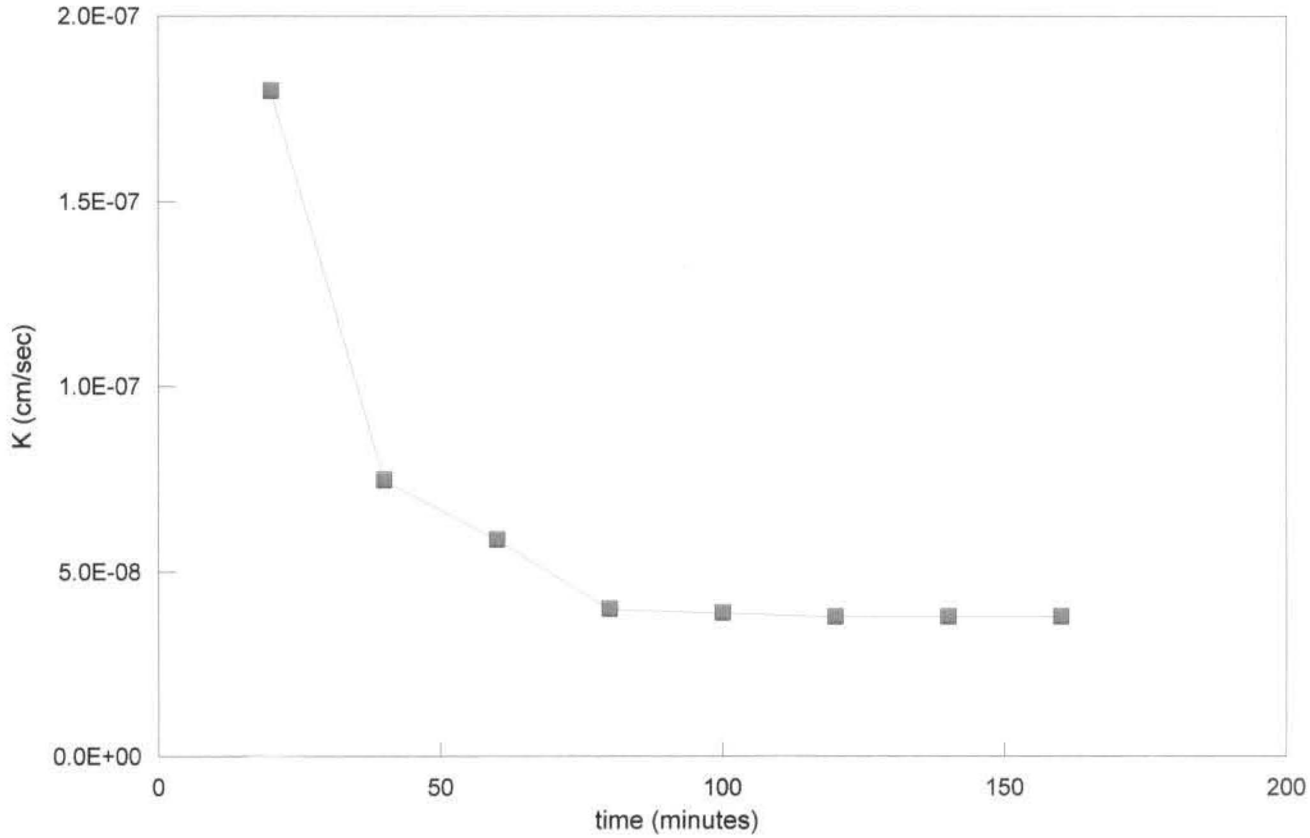
ADVANCED TERRA TESTING, INC. ATT



CONSOLIDATION DATA
211-B-001, 5.0-7.0' B, 211B001PERM1
VOLUME DEFLECTION - cc
0.2
0
-0.2
-0.4
-0.6
-0.8
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
0.25
0.5
1
2
4
9
16
30
60
120
240
360
Time in Minutes

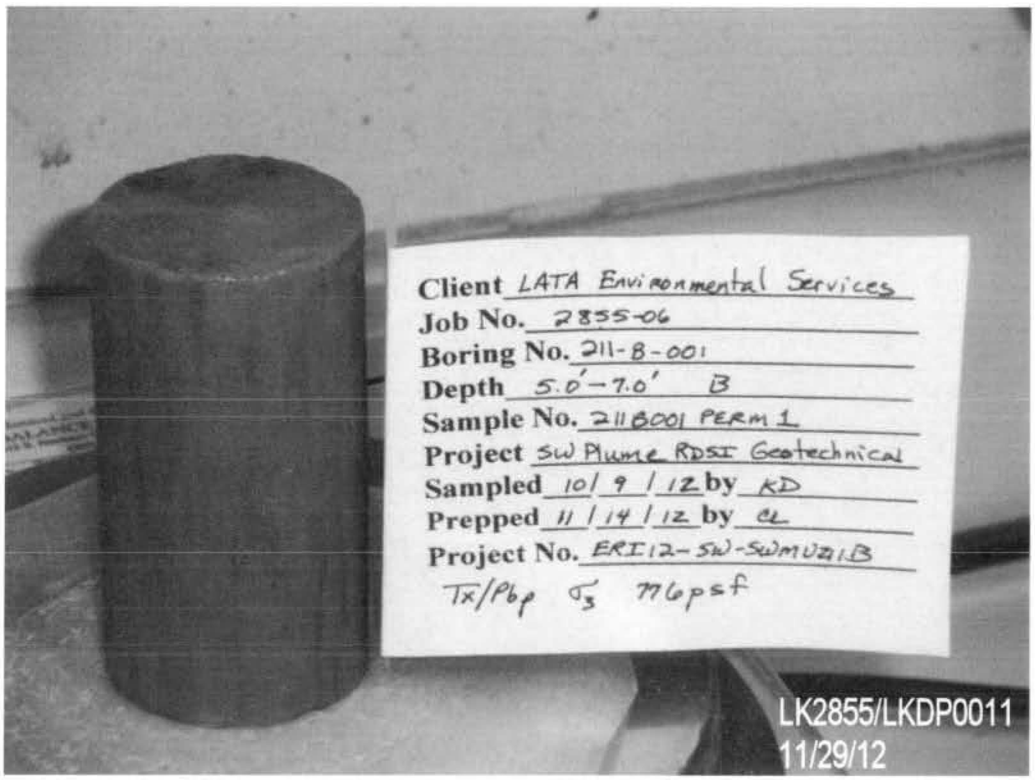
# Preliminary Flow Pump Data

LATA-KY, SW Plume Geotech, 211B001PERM1




Average last 4 values
3.8E-08

| | | | |
|---|---|---|---|
| Data Entered By: | CAL | Date: | 11/28/2012 |
| Data Checked By: | DAW | Date Checked | 11/29/12 |
| File Name: | LKFP0011 | | |


Client LATA Environmental Services
Job No. 2855-06
Boring No. 211-B-001
Depth 5.0'-7.0' B
Sample No. 211B001 PERM 1
Project SW Plume RDSI Geotechnical
Sampled 10/9/12 by KD
Prepped 11/14/12 by CL
Project No. ERI12-SW-SWMU211B
Tx/Pbp σ3 776psf
LK2855/LKDP0011
11/29/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-06 |
| BORING NO. | 211-B-001 | SAMPLED | 10/09/12 KD |
| DEPTH | 15-17' A | TEST STARTED | 11/13/12 CAL |
| SAMPLE NO. | 211B001PERM2 | TEST FINISHED | 11/19/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | CELL NUMBER | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 2070 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 231.9 | 237.0 |
| Wt. Wet Soil & Pan (g) | 238.3 | 243.5 |
| Wt. Dry Soil & Pan (g) | 214.3 | 214.3 |
| Wt. Lost Moisture (g) | 24.1 | 29.2 |
| Wt. of Pan Only (g) | 6.5 | 6.5 |
| Wt. of Dry Soil (g) | 207.8 | 207.8 |
| Moisture Content % | 11.6 | 14.1 |
| Wet Density PCF | 134.0 | 140.1 |
| Dry Density PCF | 120.1 | 122.8 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.617 | (cm) | 4.107 |
| Init. Area (sq in) | 2.054 | (sq cm) | 13.250 |
| Init. Height (in) | 3.210 | (cm) | 8.153 |
| Vol. Bef. Consol. (cu ft) | 0.00381 | | |
| Vol. After Consol. (cu ft) | 0.00373 | | |
| Porosity % | 27.66 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting (gear number) | 9 |
| Percentage of Pump setting | 100 |
| Q (cc/s) | 2.28E-04 |
| Height | 3.189 |
| Diameter | 1.604 |
| Pressure (psi) | 0.716 |
| Area after consol. (cm*cm) | 13.041 |
| Gradient | 6.215 |
| Permeability k (cm/s) | 2.8E-06 |
| **Permeability k (m/s)** | **2.8E-08** |
| Back Pressure (psi) | 58.0 |
| Cell Pressure (psi) | 72.4 |
| Ave. Effective Stress (psi) | 14.042 |

Average temperature degree C: 21.6

NOTE: Filling required on top, bottom and sides to fill gravel voids.

Data entry by: DAW Date: 11/26/2012
Checked by: CAL Date: 11/27/12
FileName: LKP00012

ADVANCED TERRA TESTING, INC. ATT

## TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services - KY | JOB NO. | 2855-06 |
| BORING NO. | 211-B-001 | SAMPLED | 10/09/12 KD |
| DEPTH | 15-17' A | TEST STARTED | 11/13/12 CAL |
| SAMPLE NO. | 211B001PERM2 | TEST FINISHED | 11/19/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | SETUP NO. | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 2070 | TEST TYPE | TX/Pbp/Tap Water |

### SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) Close | Burette Reading (CC) Open | Pore Pressure (PSI) Close | Pore Pressure (PSI) Open | Change | B |
|---|---|---|---|---|---|---|---|
| 40.0 | 38.0 | 11.7 | 17.9 | | | | |
| 50.0 | 48.0 | 18.6 | 19.4 | 38.7 | 46.4 | 7.7 | 0.77 |
| 60.0 | 58.0 | 19.5 | 20.2 | 48.6 | 56.9 | 8.3 | 0.83 |
| 70.0 | | 20.3 | 20.4 | 58.5 | 68.0 | 9.5 | 0.95 |

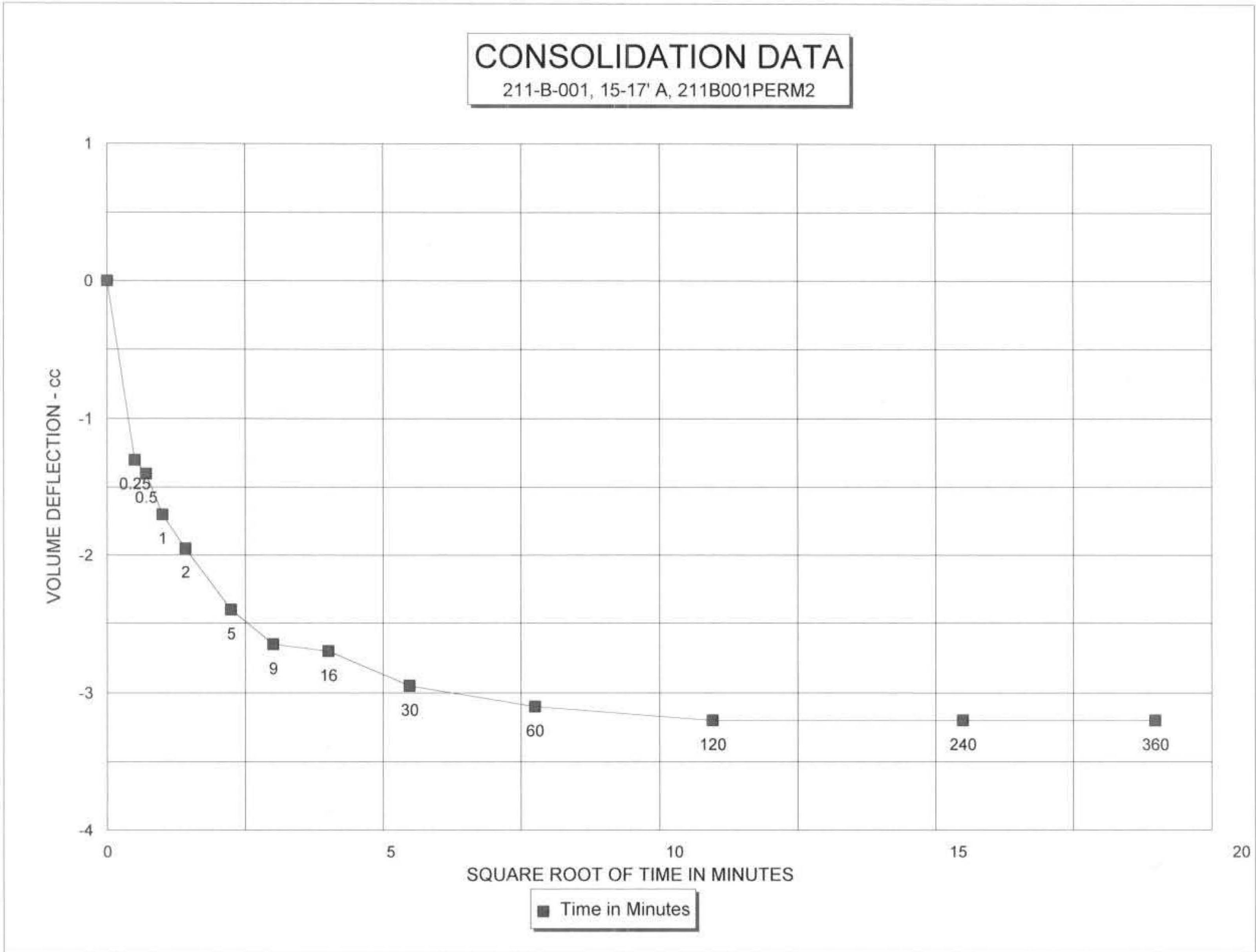
### CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.50 | 0.00 |
| 0.25 | 0.50 | 1.80 | -1.30 |
| 0.5 | 0.71 | 1.90 | -1.40 |
| 1 | 1.00 | 2.20 | -1.70 |
| 2 | 1.41 | 2.45 | -1.95 |
| 5 | 2.24 | 2.90 | -2.40 |
| 9 | 3.00 | 3.15 | -2.65 |
| 16 | 4.00 | 3.20 | -2.70 |
| 30 | 5.48 | 3.45 | -2.95 |
| 60 | 7.75 | 3.60 | -3.10 |
| 120 | 10.95 | 3.70 | -3.20 |
| 240 | 15.49 | 3.70 | -3.20 |
| 360 | 18.97 | 3.70 | -3.20 |

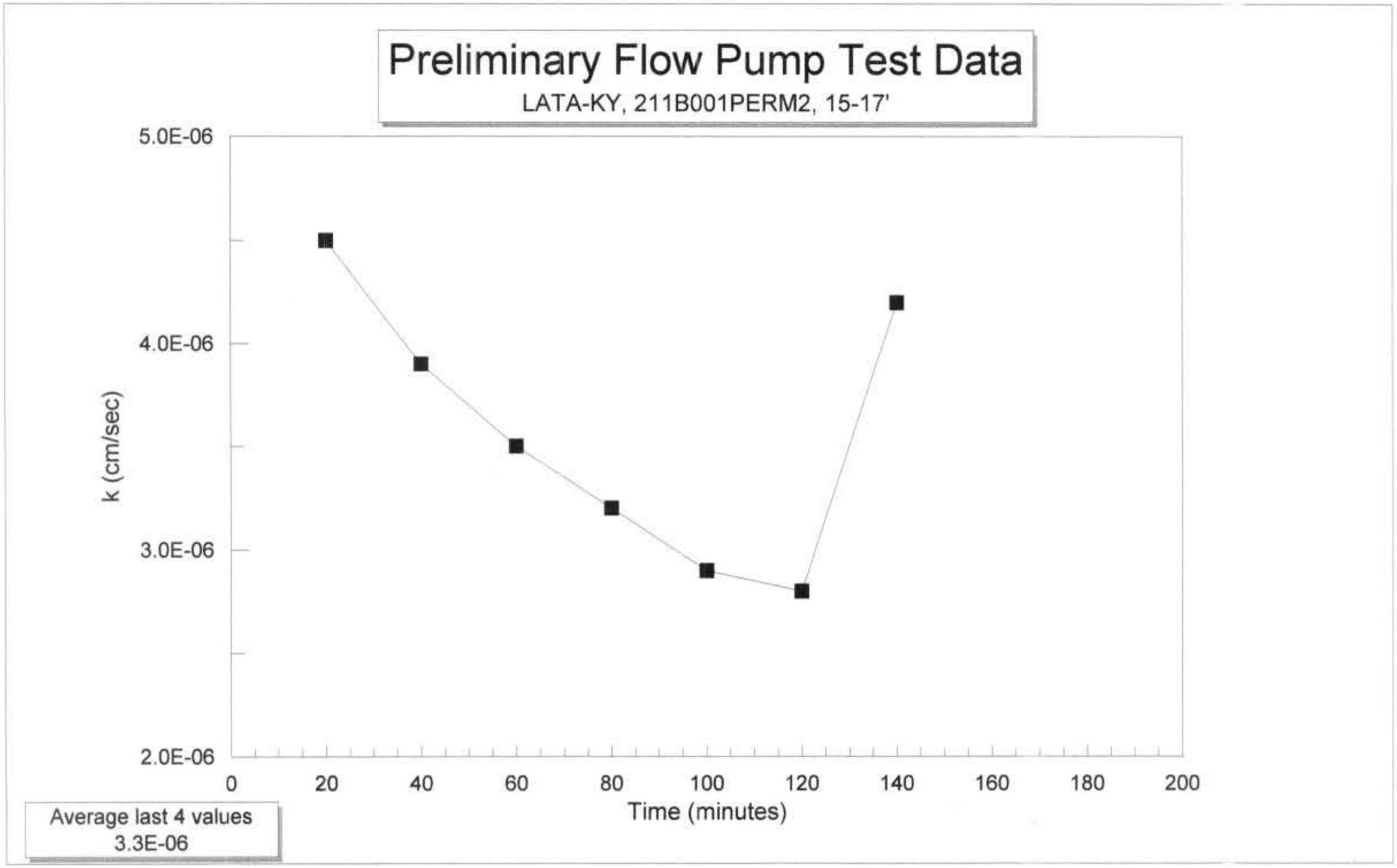
| | | | |
|---|---|---|---|
| Initial Height (in) | 3.210 | Init. Vol. (CC) | 108.04 |
| Height Change (in) | 0.021 | Vol. Change (CC) | 12.20 |
| Ht. After Cons. (in) | 3.189 | Cell Exp. (CC) | 9.81 |
| Initial Area (sq in) | 2.054 | Net Change (CC) | 2.39 |
| Area After Cons. (sq in) | 2.021 | Cons. Vol. (CC) | 105.65 |

Data entry by: DAW Date: 11/26/2012
Checked by: BRL Date: 11/27/12
FileName: LKP00012

ADVANCED TERRA TESTING, Inc. ATT

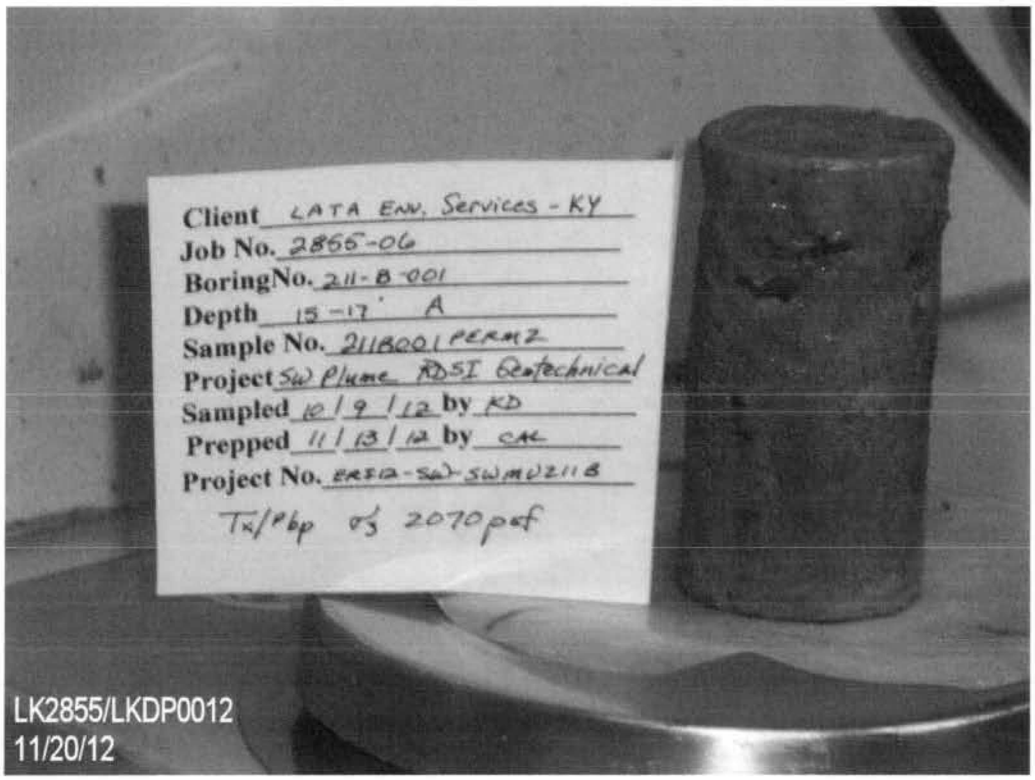

CONSOLIDATION DATA
211-B-001, 15-17' A, 211B001PERM2
VOLUME DEFLECTION - cc
1
0
-1
-2
-3
-4
0.25
0.5
1
2
5
9
16
30
60
120
240
360
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes

F-125




Data Entered By: CAL
Data Checked By: DW
File Name: LKFP0012

Date: 11/19/2012
Date Checked: 11/20/12


Client LATA ENV. Services - KY
Job No. 2855-06
BoringNo. 211-B-001
Depth 15-17' A
Sample No. 211B001PERM2
Project SW Plume RDSI Geotechnical
Sampled 10/9/12 by KD
Prepped 11/13/12 by CAL
Project No. ER512-SW-SWMU211B
Tx/Pbp σ3 2070psf
LK2855/LKDP0012
11/20/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of Ky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 8-10' (A) | TEST STARTED | 11/02/12 CAL |
| SAMPLE NO. | 211B004PERM1 | TEST FINISHED | 11/17/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | CELL NUMBER | 7P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1164 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 229.7 | 227.8 |
| Wt. Wet Soil & Pan (g) | 236.2 | 234.3 |
| Wt. Dry Soil & Pan (g) | 195.2 | 195.2 |
| Wt. Lost Moisture (g) | 41.0 | 39.1 |
| Wt. of Pan Only (g) | 6.5 | 6.5 |
| Wt. of Dry Soil (g) | 188.7 | 188.7 |
| Moisture Content % | 21.7 | 20.7 |
| Wet Density PCF | 128.1 | 140.1 |
| Dry Density PCF | 105.2 | 116.0 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.660 | (cm) | 4.216 |
| Init. Area (sq in) | 2.164 | (sq cm) | 13.964 |
| Init. Height (in) | 3.157 | (cm) | 8.019 |
| Vol. Bef. Consol. (cu ft) | 0.00395 | | |
| Vol. After Consol. (cu ft) | 0.00359 | | |
| Porosity % | 38.54 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 45 |
| Velocity CM/Sec | 2.95E-04 |
| Q (cc/s) | 9.44E-06 |
| Height | 3.133 |
| Diameter | 1.587 |
| Pressure (psi) | 0.166 |
| Area after consol. (cm*cm) | 12.759 |
| Gradient | 1.467 |
| Permeability k (cm/s) | 5.0E-07 |
| **Permeability k (m/s)** | **5.0E-09** |
| Back Pressure (psi) | 38.0 |
| Cell Pressure (psi) | 46.1 |
| Ave. Effective Stress (psi) | 8.017 |

Average temperature degree C: 22.1

Data entry by: MLM Date: 11/19/2012
Checked by: CAL Date: 11/19/12
FileName: LKP00041

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of Ky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 8-10' (A) | TEST STARTED | 11/02/12 CAL |
| SAMPLE NO. | 211B004PERM1 | TEST FINISHED | 11/17/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | SETUP NO. | 7P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1164 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 1.2 | 9.7 | | | | |
| 50.0 | | 13.0 | 13.2 | 38.8 | 48.5 | 9.7 | 0.97 |

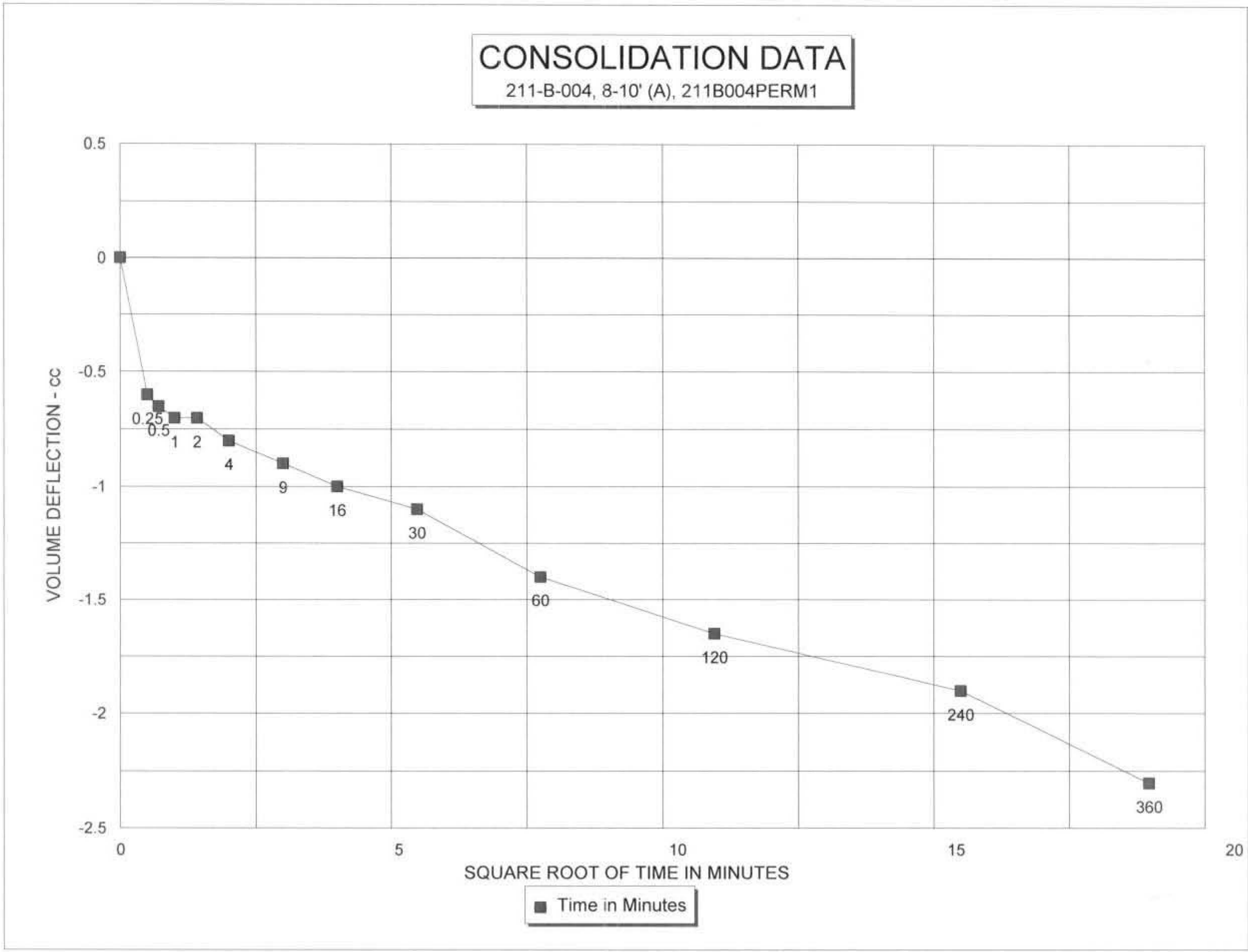
CONSOLIDATION DATA

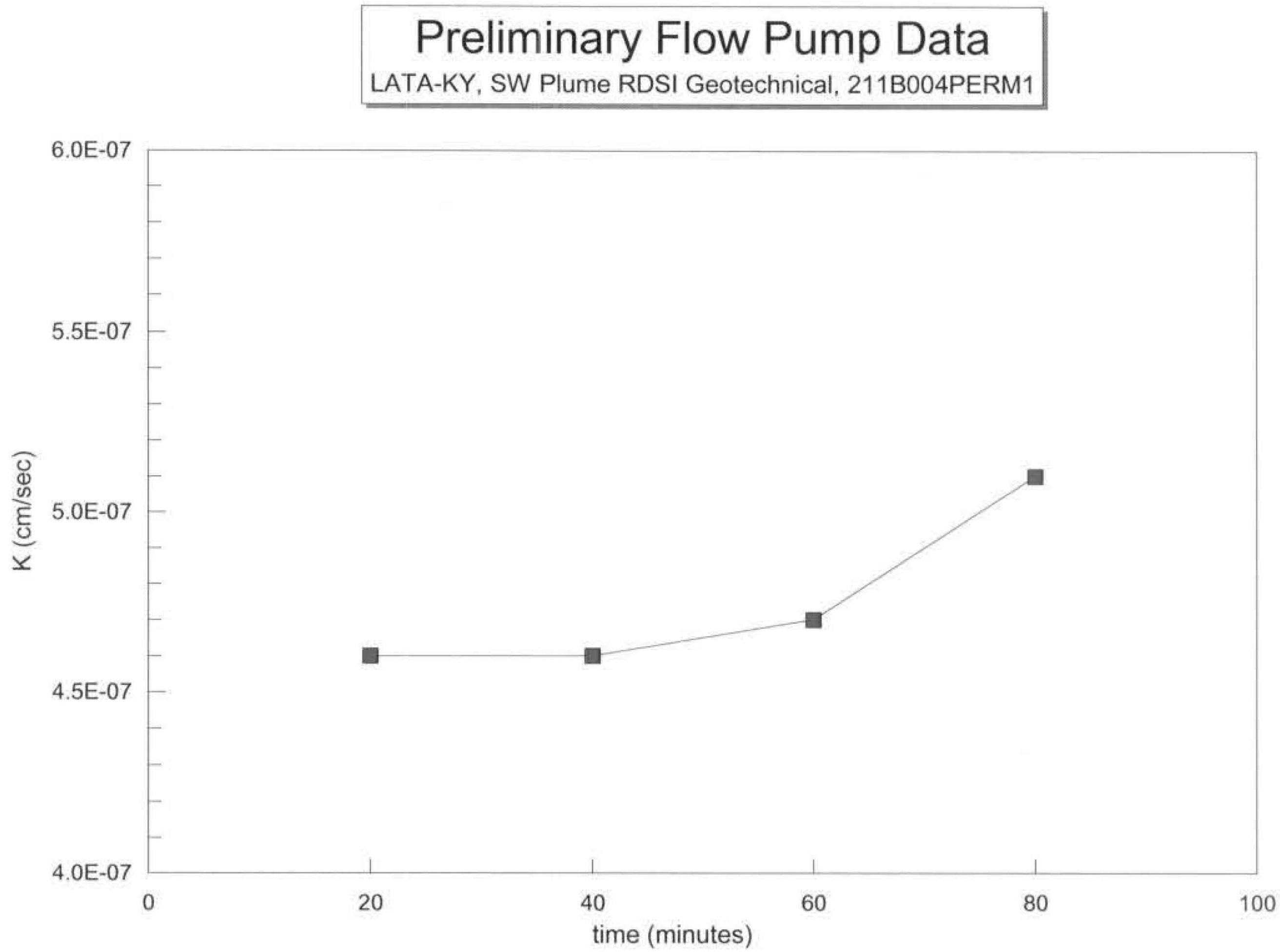
| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.30 | 0.00 |
| 0.25 | 0.50 | 0.90 | -0.60 |
| 0.5 | 0.71 | 0.95 | -0.65 |
| 1 | 1.00 | 1.00 | -0.70 |
| 2 | 1.41 | 1.00 | -0.70 |
| 4 | 2.00 | 1.10 | -0.80 |
| 9 | 3.00 | 1.20 | -0.90 |
| 16 | 4.00 | 1.30 | -1.00 |
| 30 | 5.48 | 1.40 | -1.10 |
| 60 | 7.75 | 1.70 | -1.40 |
| 120 | 10.95 | 1.95 | -1.65 |
| 240 | 15.49 | 2.20 | -1.90 |
| 360 | 18.97 | 2.60 | -2.30 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.157 | Init. Vol. (CC) | 111.98 |
| Height Change (in) | 0.024 | Vol. Change (CC) | 24.20 |
| Ht. After Cons. (in) | 3.133 | Cell Exp. (CC) | 13.76 |
| Initial Area (sq in) | 2.164 | Net Change (CC) | 10.44 |
| Area After Cons. (sq in) | 1.978 | Cons. Vol. (CC) | 101.55 |

Data entry by: MLM Date: 11/19/2012
Checked by: CAL Date: 11/19/12
FileName: LKP00041

ADVANCED TERRA TESTING, INC. ATT

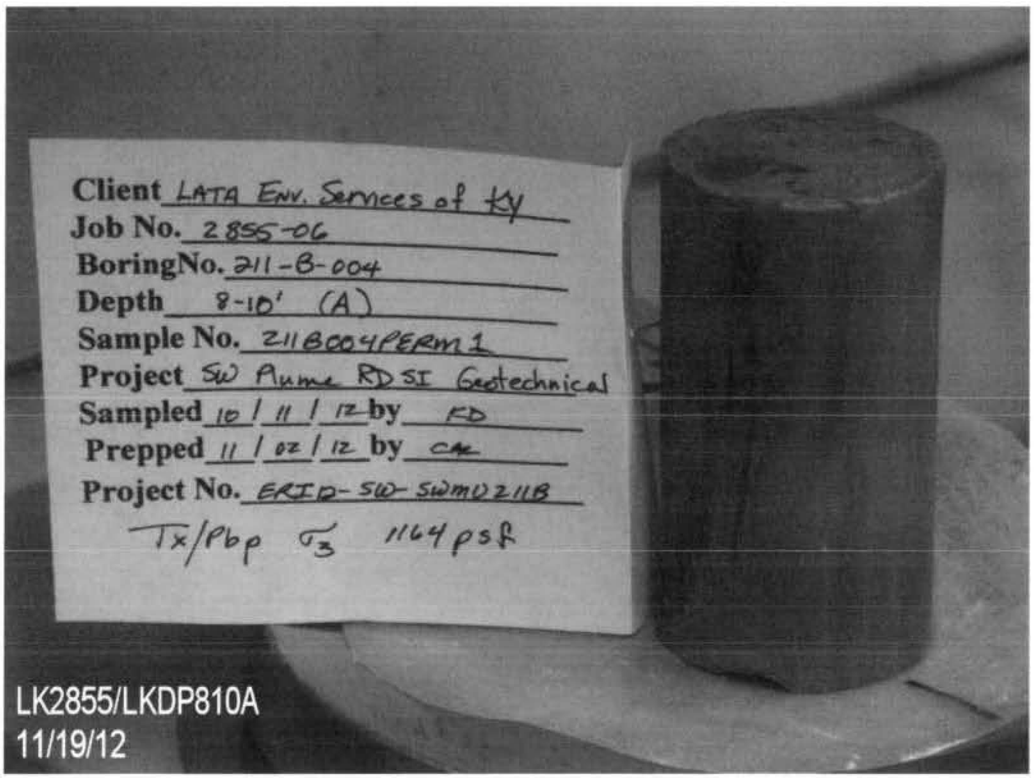

CONSOLIDATION DATA
211-B-004, 8-10' (A), 211B004PERM1
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
5
10
15
20
0.25
0.5
1
2
4
9
16
30
60
120
240
360




Average last 4 values
4.8E-07

Data Entered By: CAL
Data Checked By: DAW
File Name: LKFP0041

Date: 11/17/2012
Date Checked 11/19/12


Client LATA Env. Services of KY
Job No. 2855-06
BoringNo. 211-B-004
Depth 8-10' (A)
Sample No. 211B004PERM1
Project SW Plume RDSI Geotechnical
Sampled 10 / 11 / 12 by RD
Prepped 11 / 02 / 12 by CAL
Project No. ERID-SW-SWMU211B
Tx/Pbp σ3 1164 psf
LK2855/LKDP810A
11/19/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of KY | JOB NO. | 2855-06 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 18-20' A | TEST STARTED | 11/02/12 CAL |
| SAMPLE NO. | 211B004PERM2 | TEST FINISHED | 11/14/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | CELL NUMBER | 9P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 2458 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 210.0 | 210.5 |
| Wt. Wet Soil & Pan (g) | 216.5 | 217.1 |
| Wt. Dry Soil & Pan (g) | 191.0 | 191.0 |
| Wt. Lost Moisture (g) | 25.5 | 26.1 |
| Wt. of Pan Only (g) | 6.6 | 6.6 |
| Wt. of Dry Soil (g) | 184.4 | 184.4 |
| Moisture Content % | 13.8 | 14.1 |
| Wet Density PCF | 138.5 | 142.0 |
| Dry Density PCF | 121.7 | 124.4 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.651 | (cm) | 4.194 |
| Init. Area (sq in) | 2.141 | (sq cm) | 13.813 |
| Init. Height (in) | 2.697 | (cm) | 6.850 |
| Vol. Bef. Consol. (cu ft) | 0.00334 | | |
| Vol. After Consol. (cu ft) | 0.00327 | | |
| Porosity % | 28.16 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 2.679 |
| Diameter | 1.639 |
| Pressure (psi) | 4.700 |
| Area after consol. (cm*cm) | 13.605 |
| Gradient | 48.562 |
| Permeability k (cm/s) | 1.6E-09 |
| **Permeability k (m/s)** | **1.6E-11** |
| Back Pressure (psi) | 88.0 |
| Cell Pressure (psi) | 105.1 |
| Ave. Effective Stress (psi) | 14.750 |

Average temperature degree C: 22.1
NOTE: Filling required due to 1" gravel in sample.

Data entry by: DAW Date: 11/19/2012
Checked by: Cae Date: 11/19/2012
FileName: LKP00042

ADVANCED TERRA TESTING, INC. ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of KY | JOB NO. | 2855-06 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 18-20' A | TEST STARTED | 11/02/12 CAL |
| SAMPLE NO. | 211B004PERM2 | TEST FINISHED | 11/14/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | SETUP NO. | 9P |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 2458 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 1.2 | 7.2 | | | | |
| 50.0 | 48.0 | 9.6 | 11.0 | 38.3 | 45.9 | 7.6 | 0.76 |
| 60.0 | 58.0 | 11.4 | 12.3 | 48.6 | 56.5 | 7.9 | 0.79 |
| 70.0 | 68.0 | 13.0 | 13.8 | 58.6 | 67.2 | 8.6 | 0.86 |
| 80.0 | 78.0 | 14.3 | 15.1 | 68.6 | 77.5 | 8.9 | 0.89 |
| 90.0 | 88.0 | 15.6 | 16.4 | 78.6 | 87.6 | 9.0 | 0.90 |
| 100.0 | | 16.8 | 16.9 | 88.3 | 97.9 | 9.6 | 0.96 |

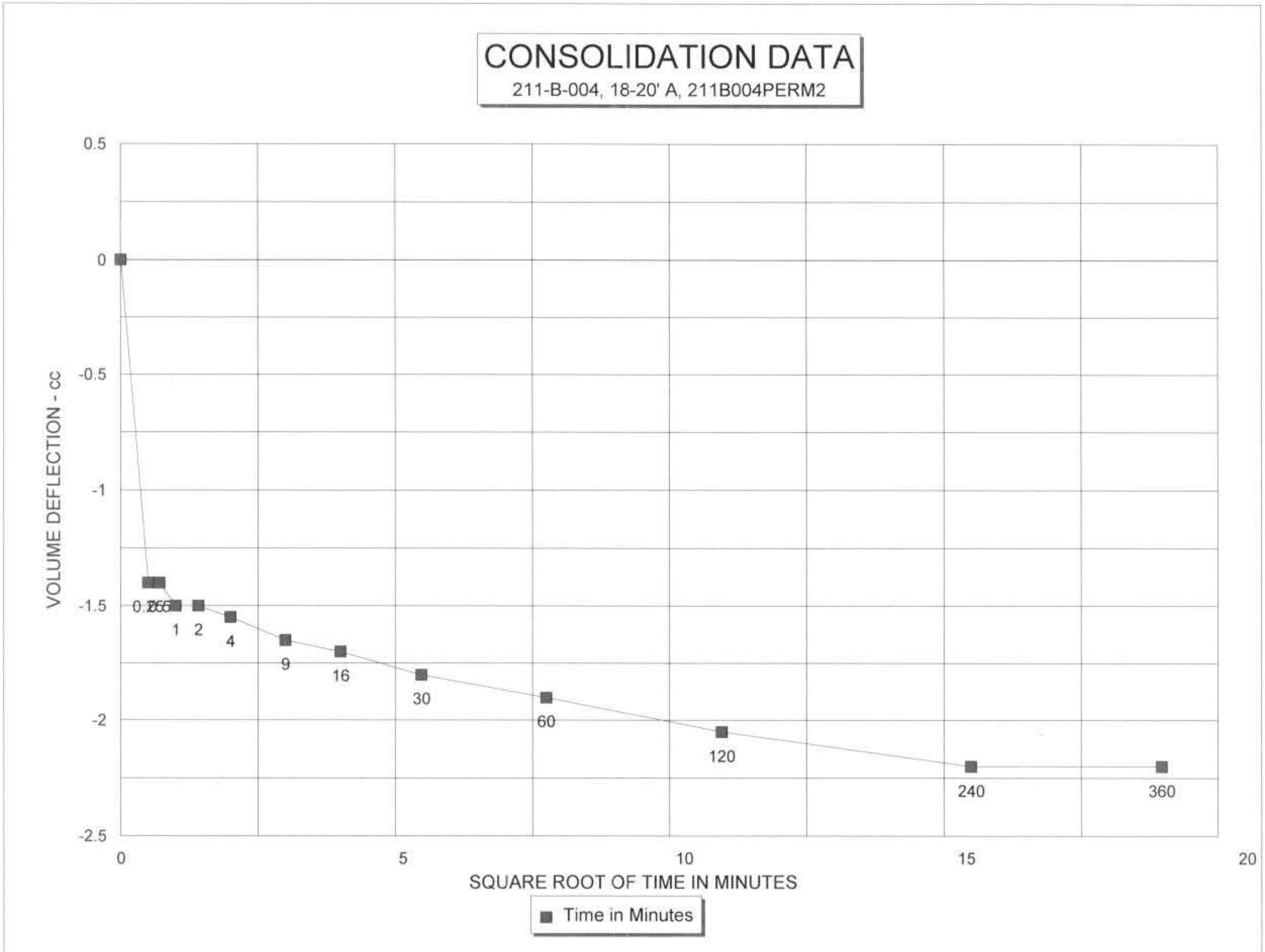
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.40 | 0.00 |
| 0.25 | 0.50 | 1.80 | -1.40 |
| 0.5 | 0.71 | 1.80 | -1.40 |
| 1 | 1.00 | 1.90 | -1.50 |
| 2 | 1.41 | 1.90 | -1.50 |
| 4 | 2.00 | 1.95 | -1.55 |
| 9 | 3.00 | 2.05 | -1.65 |
| 16 | 4.00 | 2.10 | -1.70 |
| 30 | 5.48 | 2.20 | -1.80 |
| 60 | 7.75 | 2.30 | -1.90 |
| 120 | 10.95 | 2.45 | -2.05 |
| 240 | 15.49 | 2.60 | -2.20 |
| 360 | 18.97 | 2.60 | -2.20 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 2.697 | Init. Vol. (CC) | 94.63 |
| Height Change (in) | 0.018 | Vol. Change (CC) | 18.40 |
| Ht. After Cons. (in) | 2.679 | Cell Exp. (CC) | 16.36 |
| Initial Area (sq in) | 2.141 | Net Change (CC) | 2.04 |
| Area After Cons. (sq in) | 2.109 | Cons. Vol. (CC) | 92.59 |

Data entry by: DAW Date: 11/19/2012
Checked by: CAL Date: 11/19/2012
FileName: LKP00042

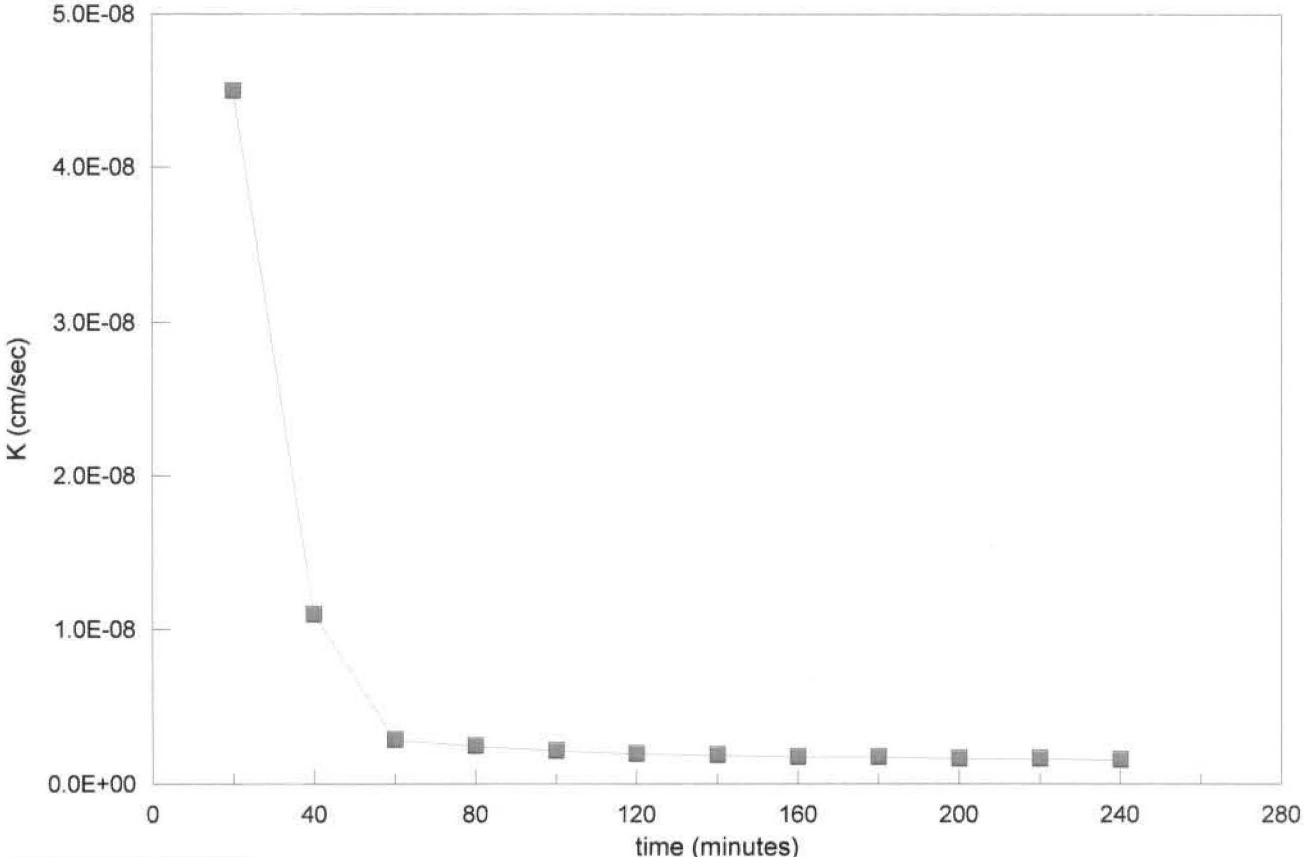
ADVANCED TERRA TESTING, Inc. ATT



CONSOLIDATION DATA
211-B-004, 18-20' A, 211B004PERM2
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
5
10
15
20
1
2
4
9
16
30
60
120
240
360

# Preliminary Flow Pump Data

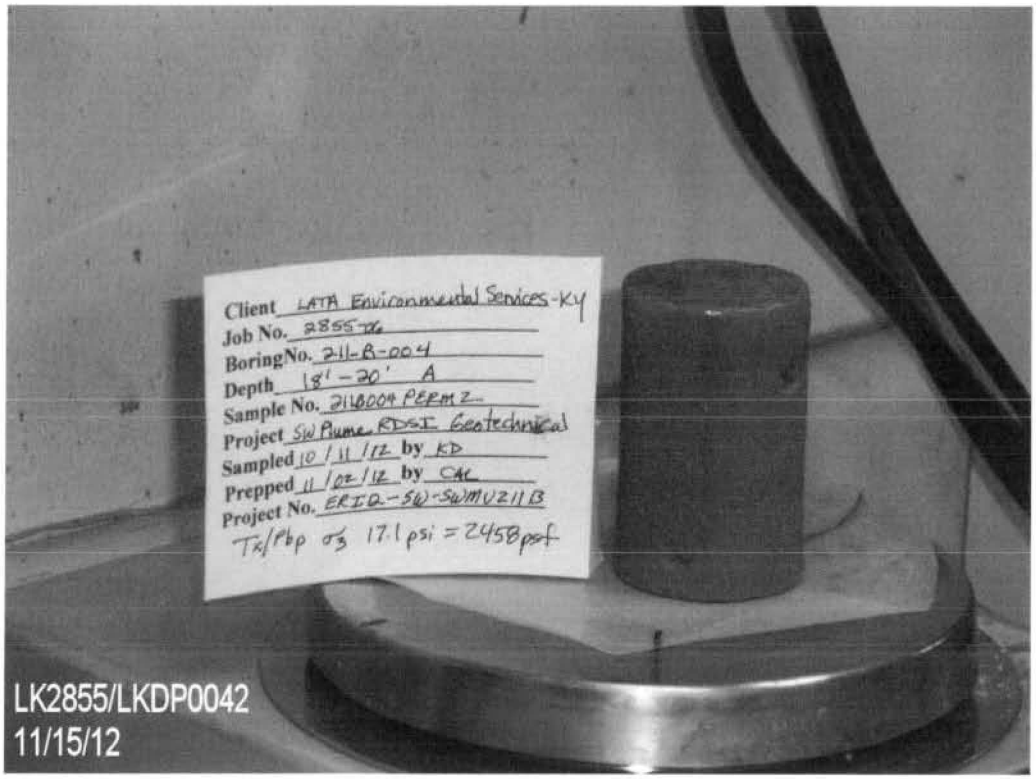
LATA-KY, SW Plume Geotech, 211B004PERM2




Average last 4 values
1.6E-09

Data Entered By: CAL
Data Checked By: DW
File Name: LKFP0042

Date: 11/14/2012
Date Checked 11/15/12


Client LATA Environmental Services-KY
Job No. 2855-TX
BoringNo. 211-B-004
Depth 18' - 20' A
Sample No. 211B004 PERM 2
Project SW Plume RDSI Geotechnical
Sampled 10 / 11 / 12 by KD
Prepped 11 / 02 / 12 by CAC
Project No. ERIQ-SW-SWMU211B
Tx/Pbp σ3 17.1 psi = 2458 psf
LK2855/LKDP0042
11/15/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT LATA Environmental Services of Ky JOB NO. 2855-06

| | | | |
|---|---|---|---|
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 38-40' (A) | TEST STARTED | 11/02/12 CAL |
| SAMPLE NO. | 211B004PERM3 | TEST FINISHED | 11/13/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | CELL NUMBER | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5046 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 236.9 | 233.1 |
| Wt. Wet Soil & Pan (g) | 243.7 | 239.9 |
| Wt. Dry Soil & Pan (g) | 203.0 | 203.0 |
| Wt. Lost Moisture (g) | 40.8 | 36.9 |
| Wt. of Pan Only (g) | 6.8 | 6.8 |
| Wt. of Dry Soil (g) | 196.2 | 196.2 |
| Moisture Content % | 20.8 | 18.8 |
| Wet Density PCF | 131.8 | 133.8 |
| Dry Density PCF | 109.1 | 112.6 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 1.662 | (cm) | 4.221 |
| Init. Area (sq in) | 2.169 | (sq cm) | 13.997 |
| Init. Height (in) | 3.157 | (cm) | 8.019 |
| Vol. Bef. Consol. (cu ft) | 0.00396 | | |
| Vol. After Consol. (cu ft) | 0.00384 | | |
| Porosity % | 33.95 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 5 |
| Velocity CM/Sec | 3.29E-05 |
| Q (cc/s) | 1.05E-06 |
| Height | 3.090 |
| Diameter | 1.654 |
| Pressure (psi) | 3.490 |
| Area after consol. (cm*cm) | 13.863 |
| Gradient | 31.264 |
| Permeability k (cm/s) | 2.4E-09 |
| **Permeability k (m/s)** | **2.4E-11** |
| Back Pressure (psi) | 48.0 |
| Cell Pressure (psi) | 83.0 |
| Ave. Effective Stress (psi) | 33.255 |

Average temperature degree C: 22.0

Data entry by: MLM Date: 11/14/2012
Checked by: CAL Date: 11/14/12
FileName: LKP00043

ADVANCED TERRA TESTING, INC. ATT

## TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services of Ky | JOB NO. | 2855-06 |
| BORING NO. | 211-B-004 | SAMPLED | 10/11/12 KD |
| DEPTH | 38-40' (A) | TEST STARTED | 11/02/12 CAL |
| SAMPLE NO. | 211B004PERM3 | TEST FINISHED | 11/13/12 CAL |
| SOIL DESCR. | ERI12-SW-SWMU211B | SETUP NO. | 13S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5046 | TEST TYPE | TX/Pbp/Tap Water |

### SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 1.8 | 6.8 | | | | |
| 50.0 | 48.0 | 7.3 | 8.1 | 38.2 | 47.5 | 9.3 | 0.93 |
| 60.0 | | 8.3 | 8.4 | 48.7 | 58.2 | 9.5 | 0.95 |

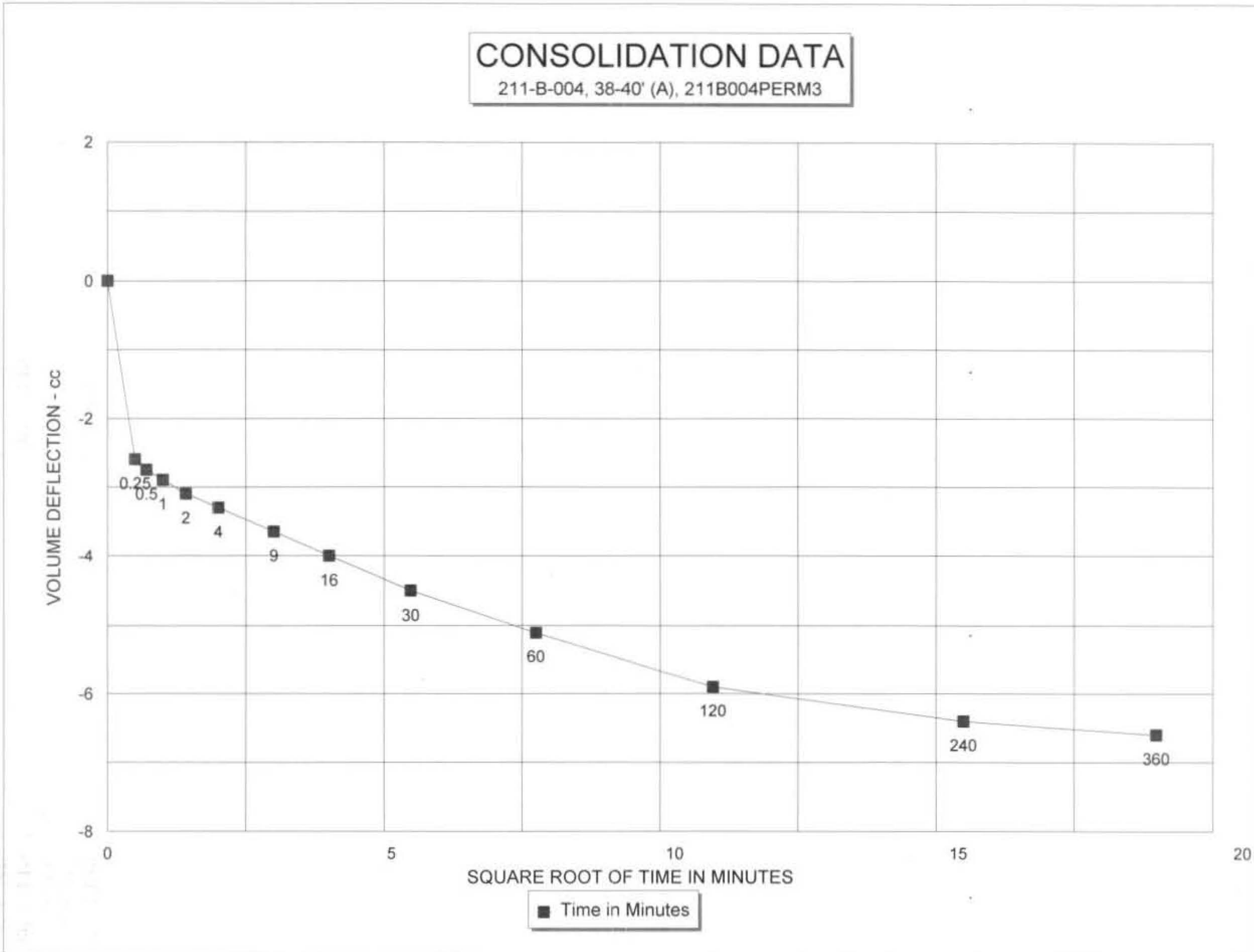
### CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.40 | 0.00 |
| 0.25 | 0.50 | 3.00 | -2.60 |
| 0.5 | 0.71 | 3.15 | -2.75 |
| 1 | 1.00 | 3.30 | -2.90 |
| 2 | 1.41 | 3.50 | -3.10 |
| 4 | 2.00 | 3.70 | -3.30 |
| 9 | 3.00 | 4.05 | -3.65 |
| 16 | 4.00 | 4.40 | -4.00 |
| 30 | 5.48 | 4.90 | -4.50 |
| 60 | 7.75 | 5.50 | -5.10 |
| 120 | 10.95 | 6.30 | -5.90 |
| 240 | 15.49 | 6.80 | -6.40 |
| 360 | 18.97 | 7.00 | -6.60 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.157 | Init. Vol. (CC) | 112.25 |
| Height Change (in) | 0.067 | Vol. Change (CC) | 14.20 |
| Ht. After Cons. (in) | 3.090 | Cell Exp. (CC) | 10.77 |
| Initial Area (sq in) | 2.169 | Net Change (CC) | 3.43 |
| Area After Cons. (sq in) | 2.149 | Cons. Vol. (CC) | 108.82 |

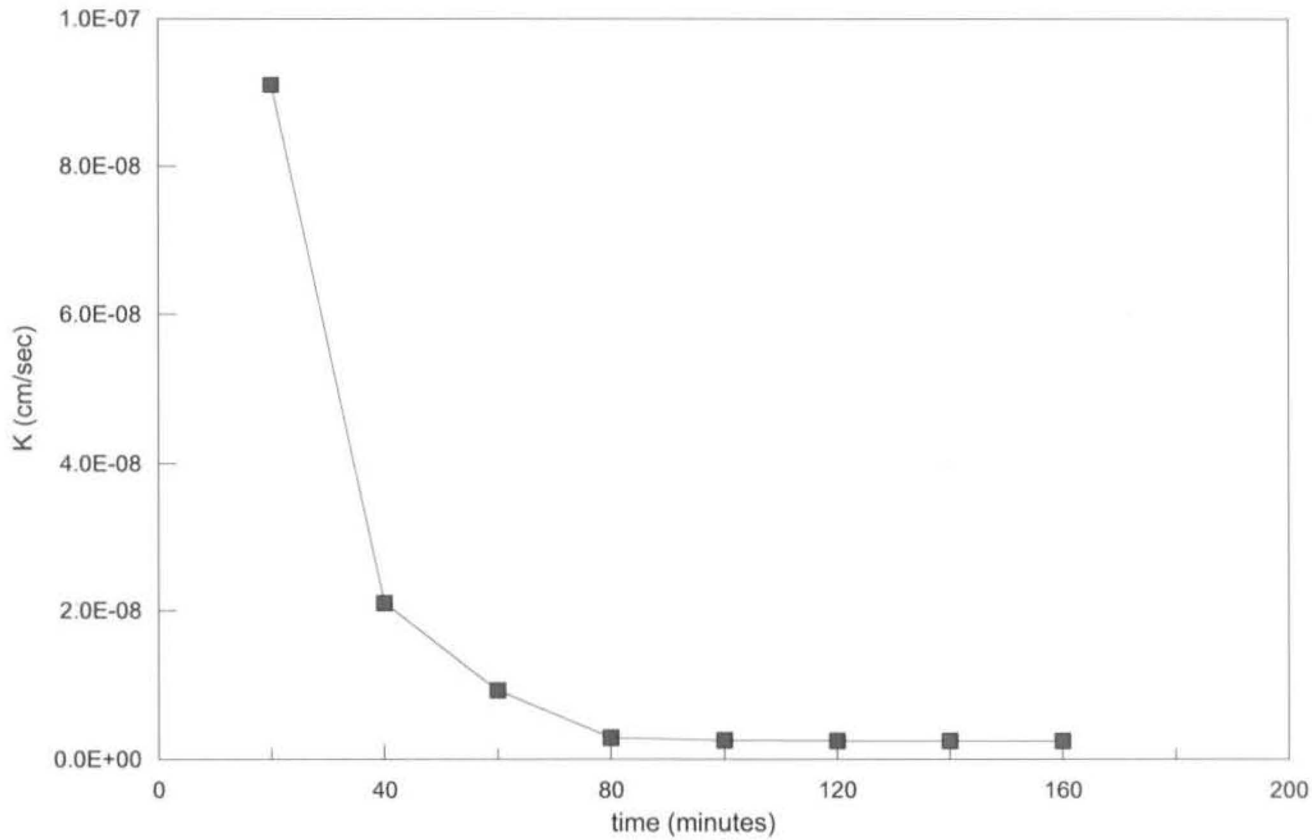
Data entry by: MLM Date: 11/14/2012
Checked by: CAL Date: 11/14/12
FileName: LKP00043

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
211-B-004, 38-40' (A), 211B004PERM3
VOLUME DEFLECTION - cc
2
0
-2
-4
-6
-8
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
0.25
0.5
1
2
4
9
16
30
60
120
240
360
Time in Minutes

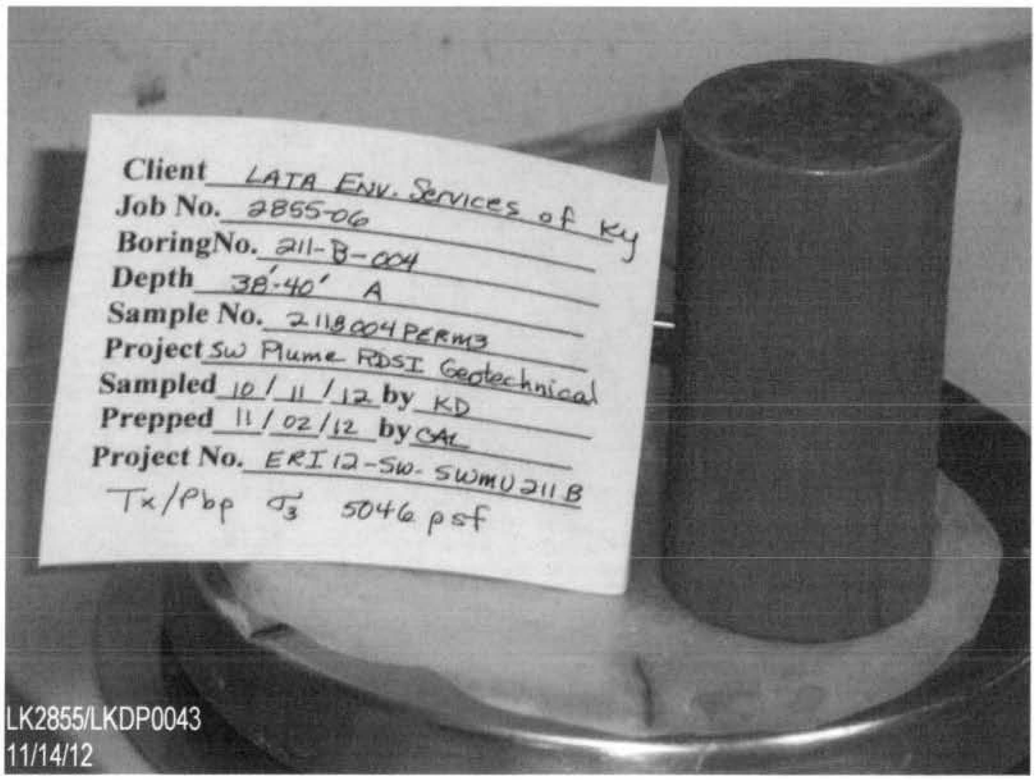
# Preliminary Flow Pump Data

LATA-KY,SW Plume RDSI Geotech.,211B004PERM3




Average last 4 values
2.5E-09

| | | | |
|---|---|---|---|
| Data Entered By: | CAL | Date: | 11-13-2012 |
| Data Checked By: | Jym | Date Checked | 11/14/12 |
| File Name: | LKFP0043 | | |


Client LATA Env. Services of Ky
Job No. 2855-06
BoringNo. 211-B-004
Depth 38'-40' A
Sample No. 2118004PERM3
Project SW Plume RDSI Geotechnical
Sampled 10/11/12 by KD
Prepped 11/02/12 by CAL
Project No. ERI12-SW-SWMU211B
Tx/Pbp σ3 5046 psf
LK2855/LKDP0043
11/14/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-02 |
| BORING NO. | MW516 | SAMPLED | 8/22/12 CB |
| DEPTH | 10-12' | TEST STARTED | 9/13/12 CAL |
| SAMPLE NO. | MW516Perm1 | TEST FINISHED | 9/22/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211B | CELL NUMBER | 27S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 1423 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 688.7 | 696.0 |
| Wt. Wet Soil & Pan (g) | 695.2 | 702.5 |
| Wt. Dry Soil & Pan (g) | 604.7 | 604.7 |
| Wt. Lost Moisture (g) | 90.5 | 97.8 |
| Wt. of Pan Only (g) | 6.5 | 6.5 |
| Wt. of Dry Soil (g) | 598.2 | 598.2 |
| Moisture Content % | 15.1 | 16.3 |
| Wet Density PCF | 134.1 | 137.6 |
| Dry Density PCF | 116.5 | 118.3 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 2.847 | (cm) | 7.231 |
| Init. Area (sq in) | 6.366 | (sq cm) | 41.073 |
| Init. Height (in) | 3.073 | (cm) | 7.805 |
| Vol. Bef. Consol. (cu ft) | 0.01132 | | |
| Vol. After Consol. (cu ft) | 0.01115 | | |
| Porosity % | 30.97 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 99 |
| Velocity CM/Sec | 6.50E-04 |
| Q (cc/s) | 2.08E-05 |
| Height | 3.058 |
| Diameter | 2.832 |
| Pressure (psi) | 0.064 |
| Area after consol. (cm*cm) | 40.644 |
| Gradient | 0.579 |
| Permeability k (cm/s) | 8.8E-07 |
| **Permeability k (m/s)** | **8.8E-09** |
| Back Pressure (psi) | 48.0 |
| Cell Pressure (psi) | 57.9 |
| Ave. Effective Stress (psi) | 9.868 |

Average temperature degree C: 23.4

Data entry by: MLM Date: 09/24/2012
Checked by: CAL Date: 9/25/12
FileName: LKP05161

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-02 |
| BORING NO. | MW516 | SAMPLED | 8/22/12 CB |
| DEPTH | 10-12' | TEST STARTED | 9/13/12 CAL |
| SAMPLE NO. | MW516Perm1 | TEST FINISHED | 9/22/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211B | SETUP NO. | 27S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF. | 1423 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 3.4 | 15.4 | | | | |
| 50.0 | 48.0 | 17.2 | 18.8 | 38.4 | 47.7 | 9.3 | 0.93 |
| 60.0 | | 19.8 | 19.9 | 48.8 | 58.7 | 9.9 | 0.99 |

CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 1.80 | 0.00 |
| 0.25 | 0.50 | 3.50 | -1.70 |
| 0.5 | 0.71 | 3.75 | -1.95 |
| 1 | 1.00 | 4.00 | -2.20 |
| 2 | 1.41 | 4.30 | -2.50 |
| 4 | 2.00 | 4.65 | -2.85 |
| 9 | 3.00 | 4.90 | -3.10 |
| 16 | 4.00 | 5.10 | -3.30 |
| 34 | 5.83 | 5.20 | -3.40 |
| 60 | 7.75 | 5.30 | -3.50 |
| 120 | 10.95 | 5.40 | -3.60 |
| 240 | 15.49 | 5.50 | -3.70 |
| 360 | 18.97 | 5.50 | -3.70 |

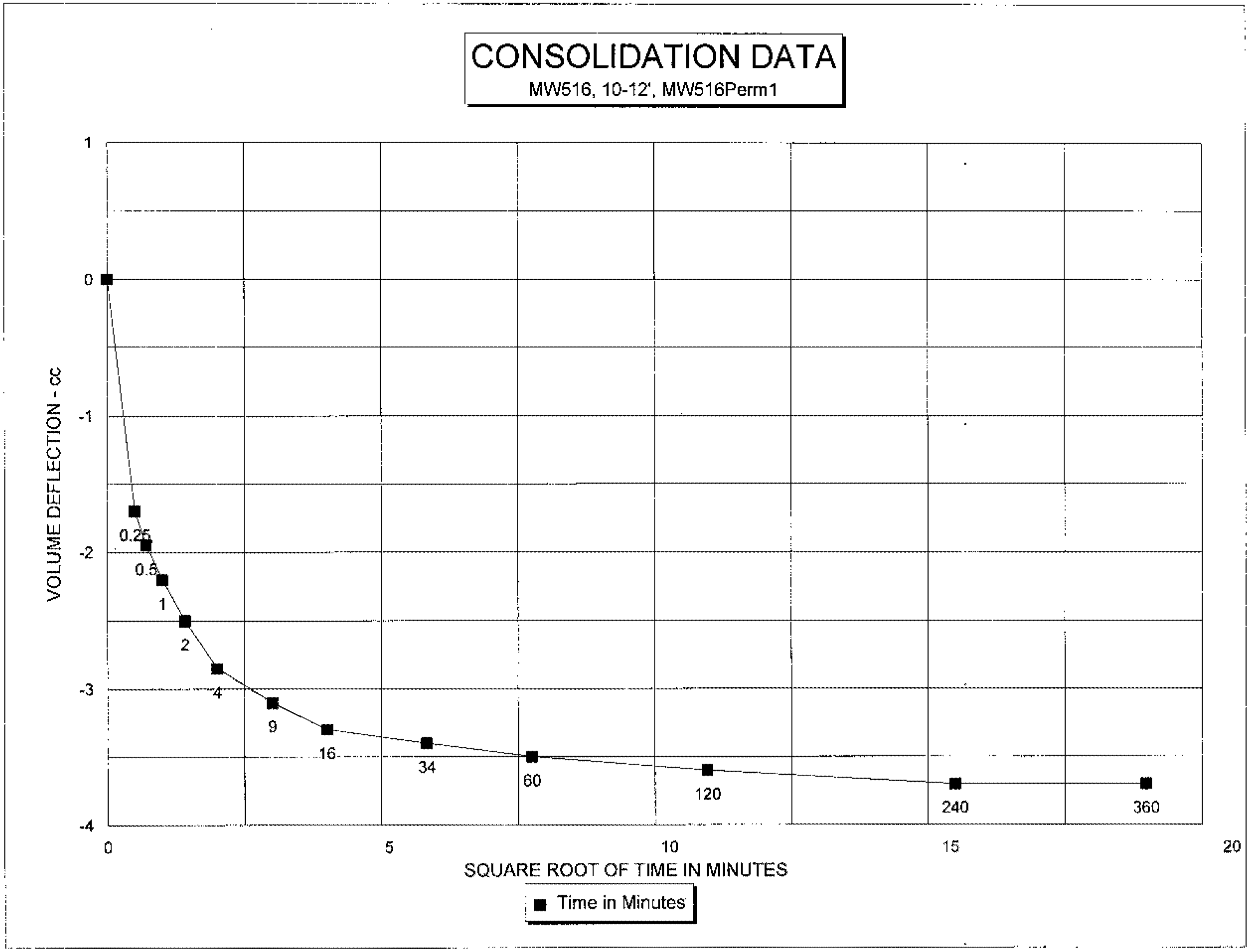
| | | | |
|---|---|---|---|
| Initial Height (in) | 3.073 | Init. Vol. (CC) | 320.63 |
| Height Change (in) | 0.015 | Vol. Change (CC) | 22.00 |
| Ht. After Cons. (in) | 3.058 | Cell Exp. (CC) | 17.12 |
| Initial Area (sq in) | 6.366 | Net Change (CC) | 4.88 |
| Area After Cons. (sq in) | 6.300 | Cons. Vol. (CC) | 315.75 |

Data entry by: MLM Date: 09/24/2012

Checked by: CAL Date: 9/25/12

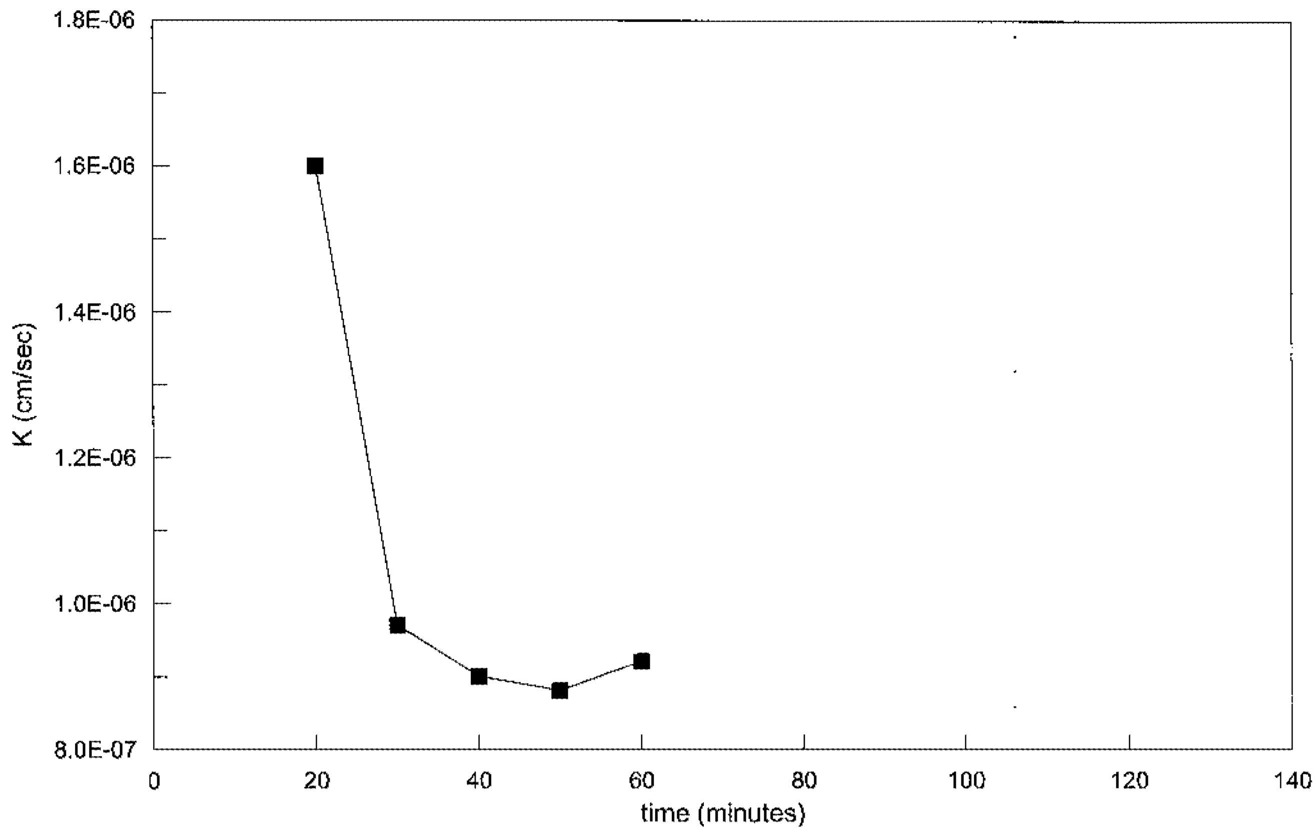
FileName: LKP05161

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
MW516, 10-12', MW516Perm1
VOLUME DEFLECTION - cc
1
0
-1
-2
-3
-4
0.25
0.5
1
2
4
9
16
34
60
120
240
360
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes

# Preliminary Flow Pump Data

LATA-KY,MW516PERM1, 10-12'




Average last 4 values
9.2E-07

Data Entered By: CAL
Data Checked By: mm
File Name: LKFP5161

Date: 9/22/2012
Date Checked 9/24/12

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT LATA Environmental Services-Ky JOB NO. 2855-02

| | | | |
|---|---|---|---|
| BORING NO. | MW-516 | SAMPLED | 8/22/12 CB |
| DEPTH | 25-26' | TEST STARTED | 9/13/12 CAL |
| SAMPLE NO. | MW516PERM2 | TEST FINISHED | 9/25/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211B | CELL NUMBER | 26S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 3299 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 647.0 | 654.8 |
| Wt. Wet Soil & Pan (g) | 653.5 | 661.3 |
| Wt. Dry Soil & Pan (g) | 569.2 | 569.2 |
| Wt. Lost Moisture (g) | 84.3 | 92.1 |
| Wt. of Pan Only (g) | 6.5 | 6.5 |
| Wt. of Dry Soil (g) | 562.7 | 562.7 |
| Moisture Content % | 15.0 | 16.4 |
| Wet Density PCF | 127.0 | 137.3 |
| Dry Density PCF | 110.4 | 117.9 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 2.841 | (cm) | 7.216 |
| Init. Area (sq in) | 6.339 | (sq cm) | 40.900 |
| Init. Height (in) | 3.062 | (cm) | 7.777 |
| Vol. Bef. Consol. (cu ft) | 0.01123 | | |
| Vol. After Consol. (cu ft) | 0.01052 | | |
| Porosity % | 30.92 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting (gear number) | 12 |
| Percentage of Pump setting | 100 |
| Q (cc/s) | 2.30E-05 |
| Height | 2.985 |
| Diameter | 2.784 |
| Pressure (psi) | 1.414 |
| Area after consol. (cm*cm) | 39.280 |
| Gradient | 13.112 |
| Permeability k (cm/s) | 4.5E-08 |
| **Permeability k (m/s)** | **4.5E-10** |
| Back Pressure (psi) | 48.0 |
| Cell Pressure (psi) | 71.0 |
| Ave. Effective Stress (psi) | 22.293 |
| Average temperature degree C: | 22.9 |

Data entry by: MLM Date: 09/26/2012
Checked by: CAL Date: 9/26/12
FileName: LKP05162

ADVANCED TERRA TESTING, INC. ATT

## TRIAXAL COMPRESSION TEST DATA

| | | | | |
|---|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | | JOB NO. | 2855-02 |
| BORING NO. | MW-516 | | SAMPLED | 8/22/12 CB |
| DEPTH | 25-26' | | TEST STARTED | 9/13/12 CAL |
| SAMPLE NO. | MW516PERM2 | | TEST FINISHED | 9/25/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211B | | SETUP NO. | 26S |
| LOCATION | SW Plume RDSI Geotechnical | | SATURATED TEST | Yes |
| CONF. PRES. PSF | 3299 | | TEST TYPE | TX/Pbp/Tap Water |

### SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 6.3 | 21.9 | | | | |
| 50.0 | 48.0 | 25.6 | 26.9 | 38.6 | 47.7 | 9.1 | 0.91 |
| 60.0 | | 27.2 | 27.4 | 48.8 | 58.3 | 9.5 | 0.95 |

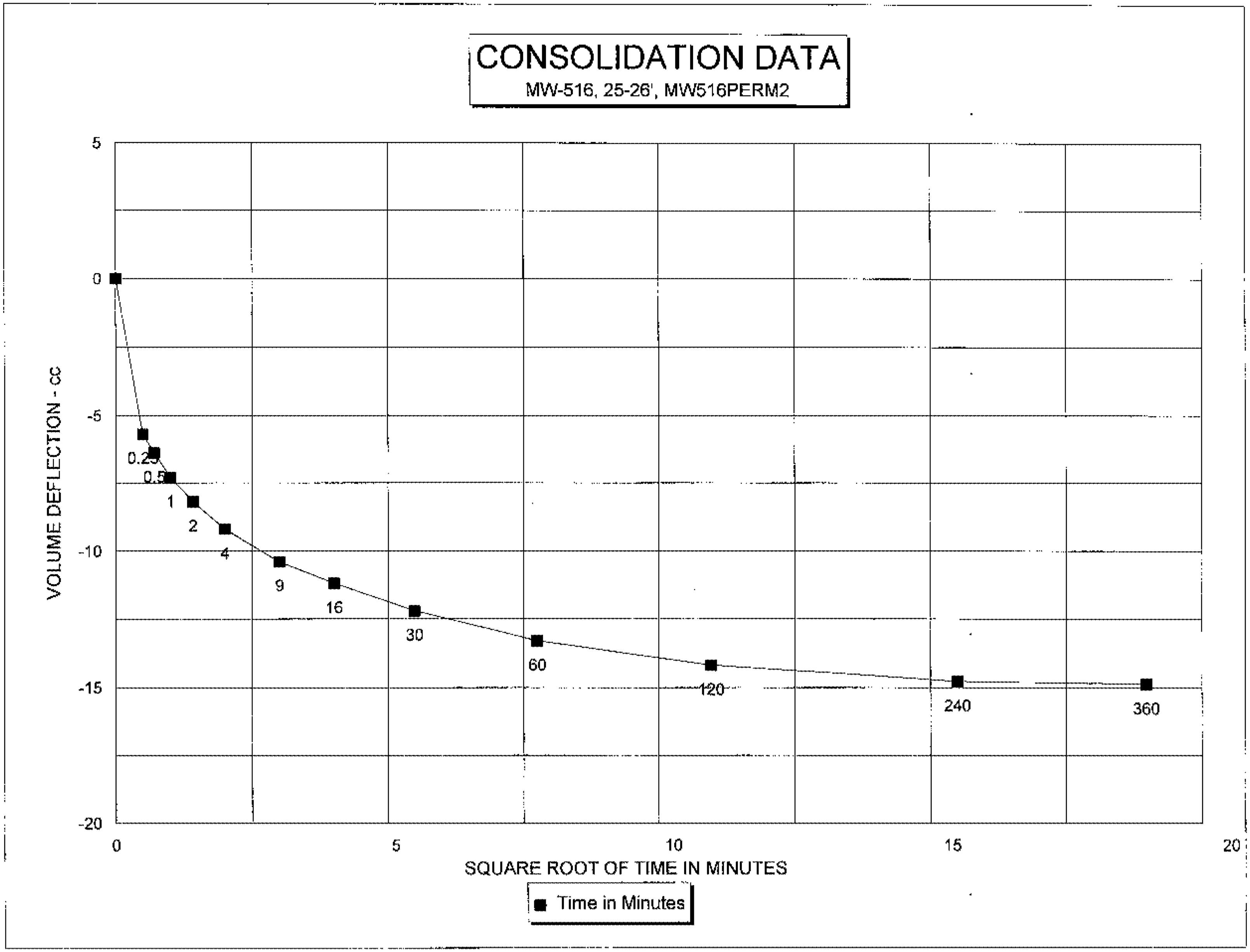
### CONSOLIDATION DATA

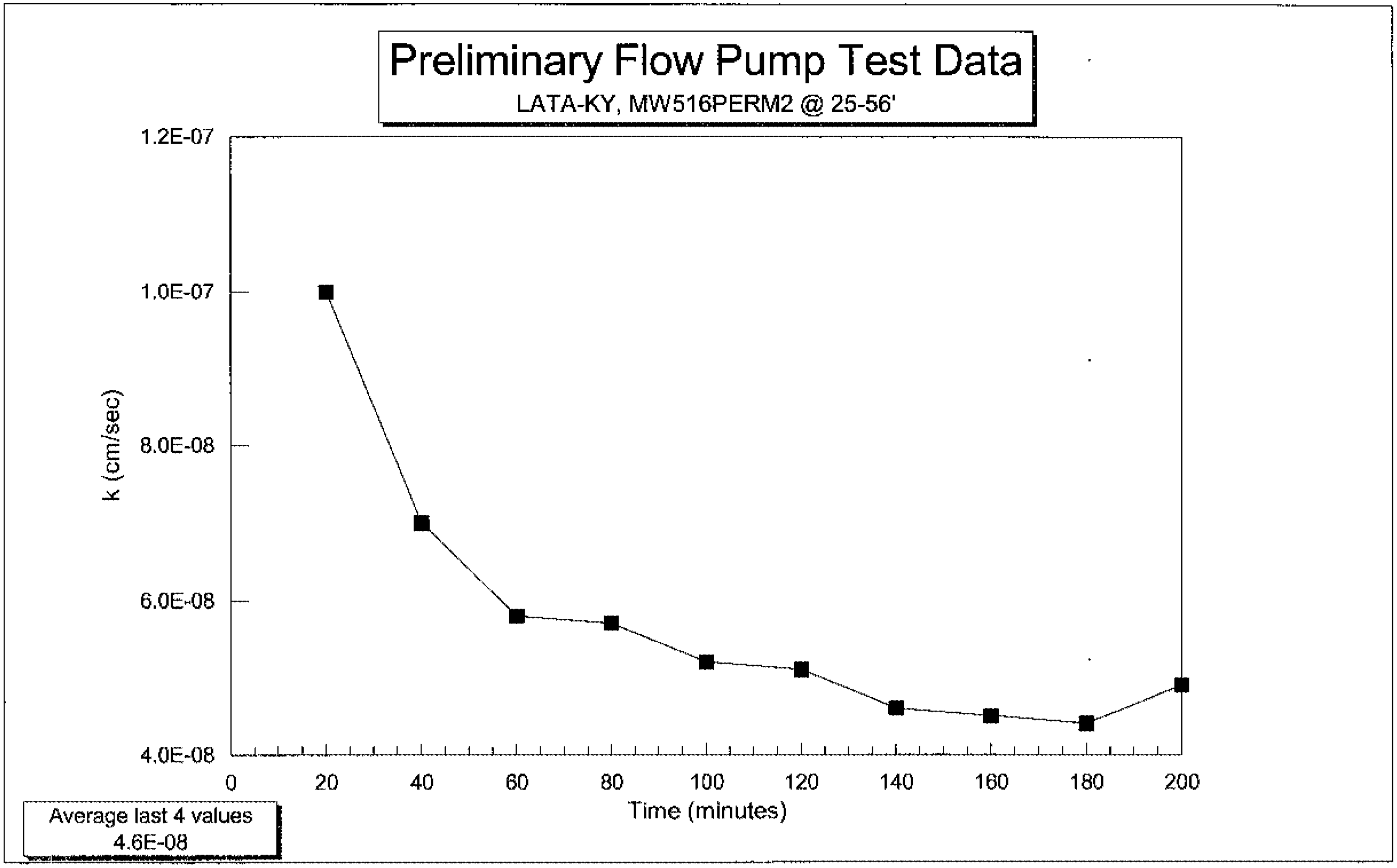
| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.20 | 0.00 |
| 0.25 | 0.50 | 5.90 | -5.70 |
| 0.5 | 0.71 | 6.60 | -6.40 |
| 1 | 1.00 | 7.50 | -7.30 |
| 2 | 1.41 | 8.40 | -8.20 |
| 4 | 2.00 | 9.40 | -9.20 |
| 9 | 3.00 | 10.60 | -10.40 |
| 16 | 4.00 | 11.40 | -11.20 |
| 30 | 5.48 | 12.40 | -12.20 |
| 60 | 7.75 | 13.50 | -13.30 |
| 120 | 10.95 | 14.40 | -14.20 |
| 240 | 15.49 | 15.00 | -14.80 |
| 360 | 18.97 | 15.10 | -14.90 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.062 | Init. Vol. (CC) | 318.14 |
| Height Change (in) | 0.077 | Vol. Change (CC) | 38.20 |
| Ht. After Cons. (in) | 2.985 | Cell Exp. (CC) | 17.93 |
| Initial Area (sq in) | 6.339 | Net Change (CC) | 20.27 |
| Area After Cons. (sq in) | 6.088 | Cons. Vol. (CC) | 297.87 |

Data entry by: MLM Date: 09/26/2012
Checked by: CAL Date: 9/26/12
FileName: LKP05162

ADVANCED TERRA TESTING, INC. ATT


CONSOLIDATION DATA
MW-516, 25-26', MW516PERM2
VOLUME DEFLECTION - cc
5
0
-5
-10
-15
-20
0
5
10
15
20
SQUARE ROOT OF TIME IN MINUTES
0.25
0.5
1
2
4
9
16
30
60
120
240
360
Time in Minutes




| | | | |
|---|---|---|---|
| Data Entered By: | CAL | Date: | 9/25/2012 |
| Data Checked By: | gm | Date Checked: | 9/26/12 |
| File Name: | LKFP5162 | | |

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-02 |
| BORING NO. | MW516 | SAMPLED | 8/23/12 KD |
| DEPTH | 40-42' | TEST STARTED | 9/13/12 CAL |
| SAMPLE NO. | MW516PERM3 | TEST FINISHED | 9/15/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211B | CELL NUMBER | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5305 | TEST TYPE | TX/Pbp/Tap Water |

| MOISTURE/DENSITY DATA | BEFORE TEST | AFTER TEST |
|---|---|---|
| Wt. Soil + Moisture (g) | 706.5 | 704.6 |
| Wt. Wet Soil & Pan (g) | 713.1 | 711.2 |
| Wt. Dry Soil & Pan (g) | 617.5 | 617.5 |
| Wt. Lost Moisture (g) | 95.6 | 93.7 |
| Wt. of Pan Only (g) | 6.6 | 6.6 |
| Wt. of Dry Soil (g) | 610.9 | 610.9 |
| Moisture Content % | 15.7 | 15.3 |
| Wet Density PCF | 134.8 | 140.4 |
| Dry Density PCF | 116.5 | 121.7 |

| | | | |
|---|---|---|---|
| Init. Diameter (in) | 2.862 | (cm) | 7.269 |
| Init. Area (sq in) | 6.433 | (sq cm) | 41.507 |
| Init. Height (in) | 3.104 | (cm) | 7.884 |
| Vol. Bef. Consol. (cu ft) | 0.01156 | | |
| Vol. After Consol. (cu ft) | 0.01106 | | |
| Porosity % | 29.92 | | |

FLOW PUMP CALCULATIONS

| | |
|---|---|
| Pump Setting | 45 |
| Velocity CM/Sec | 2.95E-04 |
| Q (cc/s) | 9.44E-06 |
| Height | 3.081 |
| Diameter | 2.811 |
| Pressure (psi) | 0.240 |
| Area after consol. (cm*cm) | 40.026 |
| Gradient | 2.156 |
| Permeability k (cm/s) | 1.1E-07 |
| **Permeability k (m/s)** | **1.1E-09** |
| Back Pressure (psi) | 38.0 |
| Cell Pressure (psi) | 74.8 |
| Ave. Effective Stress (psi) | 36.680 |

Average temperature degree C: 23.0

Data entry by: MLM Date: 09/17/2012
Checked by: CAL Date: 9/22/12
FileName: LKP05163

ATT

TRIAXAL COMPRESSION TEST DATA

| | | | |
|---|---|---|---|
| CLIENT | LATA Environmental Services-Ky | JOB NO. | 2855-02 |
| BORING NO. | MW516 | SAMPLED | 8/23/12 KD |
| DEPTH | 40-42' | TEST STARTED | 9/13/12 CAL |
| SAMPLE NO. | MW516PERM3 | TEST FINISHED | 9/15/12 CAL |
| PROJECT NO. | ERI12-SW-SWMU211B | SETUP NO. | 15S |
| LOCATION | SW Plume RDSI Geotechnical | SATURATED TEST | Yes |
| CONF. PRES. PSF | 5305 | TEST TYPE | TX/Pbp/Tap Water |

SATURATION DATA

| Cell Pres. (PSI) | Back Pres. (PSI) | Burette Reading (CC) | | Pore Pressure (PSI) | | Change | B |
|---|---|---|---|---|---|---|---|
| | | Close | Open | Close | Open | | |
| 40.0 | 38.0 | 3.0 | 12.8 | | | | |
| 50.0 | | 13.5 | 13.7 | 39.1 | 48.7 | 9.6 | 0.96 |

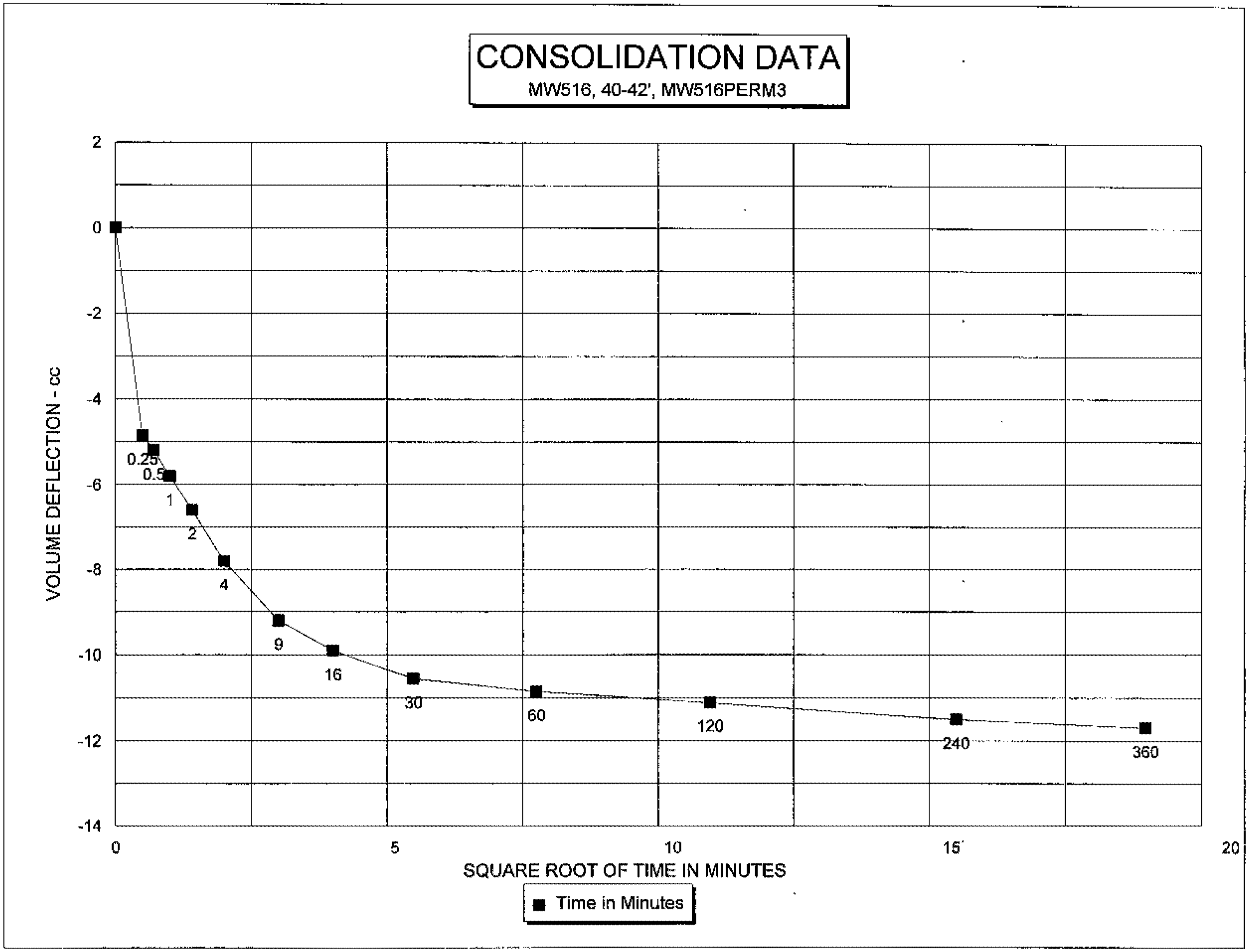
CONSOLIDATION DATA

| Elapsed Time (Min) | SQRT Time (Min) | Burette Reading (CC) | Volume Defl. (cc) |
|---|---|---|---|
| 0.00 | 0.00 | 0.50 | 0.00 |
| 0.25 | 0.50 | 5.35 | -4.85 |
| 0.5 | 0.71 | 5.70 | -5.20 |
| 1 | 1.00 | 6.30 | -5.80 |
| 2 | 1.41 | 7.10 | -6.60 |
| 4 | 2.00 | 8.30 | -7.80 |
| 9 | 3.00 | 9.70 | -9.20 |
| 16 | 4.00 | 10.40 | -9.90 |
| 30 | 5.48 | 11.05 | -10.55 |
| 60 | 7.75 | 11.35 | -10.85 |
| 120 | 10.95 | 11.60 | -11.10 |
| 240 | 15.49 | 12.00 | -11.50 |
| 360 | 18.97 | 12.20 | -11.70 |

| | | | |
|---|---|---|---|
| Initial Height (in) | 3.104 | Init. Vol. (CC) | 327.29 |
| Height Change (in) | 0.023 | Vol. Change (CC) | 24.00 |
| Ht. After Cons. (in) | 3.081 | Cell Exp. (CC) | 10.00 |
| Initial Area (sq in) | 6.433 | Net Change (CC) | 14.00 |
| Area After Cons. (sq in) | 6.204 | Cons. Vol. (CC) | 313.29 |

Data entry by: MLM Date: 09/17/2012
Checked by: CM Date: 9/22/12
FileName: LKP05163

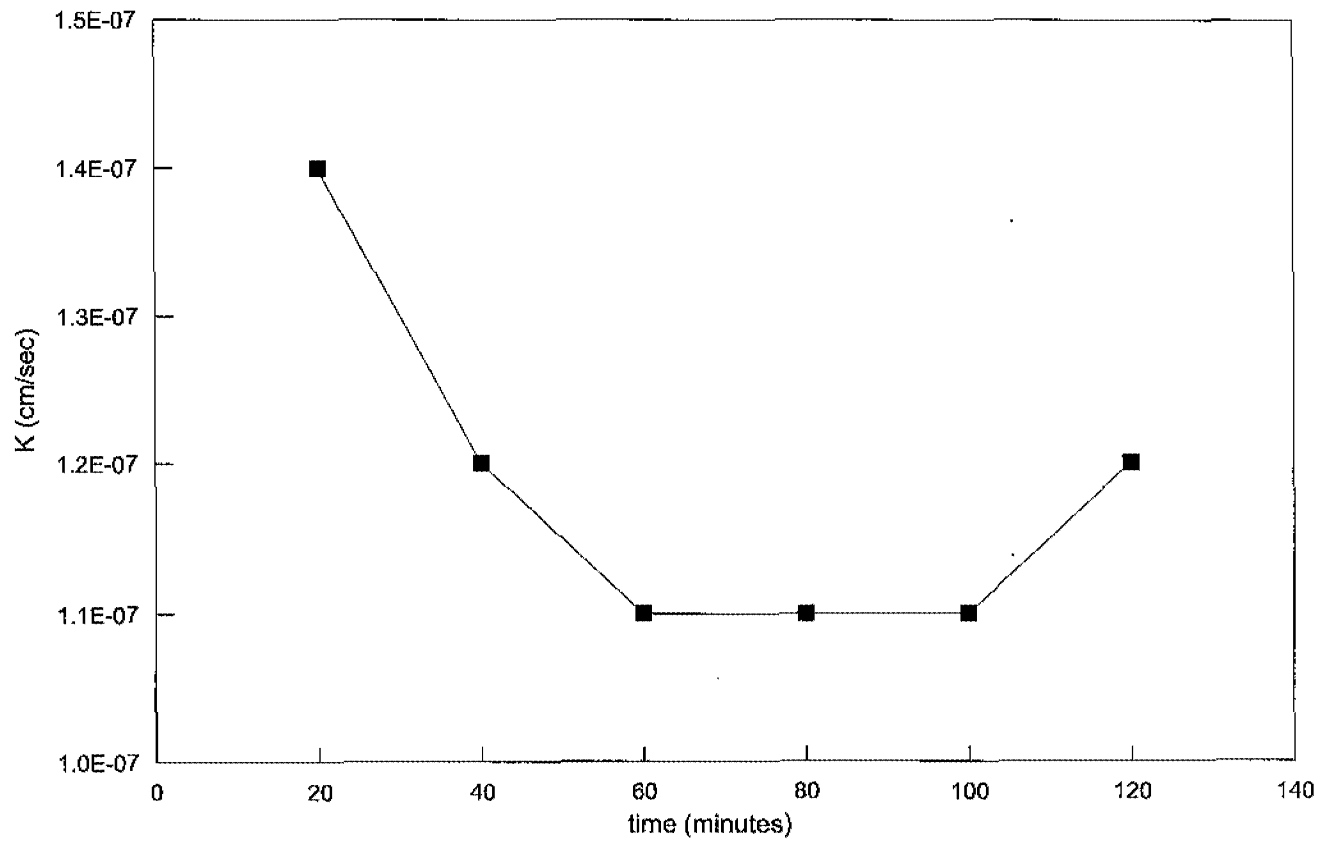
ADVANCED TERRA TESTING, INC. ATT



CONSOLIDATION DATA
MW516, 40-42', MW516PERM3
VOLUME DEFLECTION - cc
SQUARE ROOT OF TIME IN MINUTES
Time in Minutes
2
0
-2
-4
-6
-8
-10
-12
-14
0
5
10
15
20
0.25
0.5
1
2
4
9
16
30
60
120
240
360

# Preliminary Flow Pump Data

LATA-KY, MW516PERM3 @ 40-42'




Average last 4 values
1.1E-07

Data Entered By: CAL
Data Checked By: mjm
File Name: LKFP5163

Date: 9/15/2012
Date Checked 9/17/12

# WELL INJECTION TEST RECORD

| | | | | | |
|---|---|---|---|---|---|
| DATE | 10/23/2012 | TIME | 11:40 | WELL ID | MW-511 |
| ADJ WELL | MW-513 | TECH | J. Brownfield | RECD BY | T. Mills |

| TIME | FLOW (gpm) | PRESS (psi) | DTW Adj Well | | TIME | FLOW | PRESS | DTW Adj Well |
|---|---|---|---|---|---|---|---|---|
| 11:40 | 2.5 | 25 | 16.63 | | | | | |
| 11:43 | 2.2 | 25 | 13.31 | | | | | |
| 11:46 | 2.2 | 25 | 12.89 | | | | | |
| 11:49 | 2.2 | 25 | 12.78 | | | | | |
| 11:52 | 3.1 | 50 | 12.42 | | | | | |
| 11:55 | 3.1 | 50 | 11.85 | | | | | |
| 11:58 | 3.1 | 50 | 11.67 | | | | | |
| 12:01 | 3.9 | 75 | 11.14 | | | | | |
| 12:04 | 3.9 | 75 | 10.37 | | | | | |
| 12:07 | 3.9 | 75 | 9.79 | | | | | |
| 12:10 | 4.8 | 100 | 9.55 | | | | | |
| 12:13 | 4.8 | 100 | 9.42 | | | | | |
| 12:16 | 4.8 | 100 | 9.42 | | | | | |
| Test Complete per Ken Davis | | | | | | | | |
| | | | | | | | | |
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WELL INJECTION TEST RECORD

| | | | | | |
|---|---|---|---|---|---|
| DATE | 10/23/2012 | TIME | 12:30 | WELL ID | MW-512 |
| ADJ WELL | N/A | TECH | J. Brownfield | RECD BY | T. Mills |

| TIME | FLOW (gpm) | PRESS (psi) | DTW Adj Well | | TIME | FLOW | PRESS | DTW Adj Well |
|---|---|---|---|---|---|---|---|---|
| 12:35 | 2.3 | 25 | N/A | | | | | |
| 12:38 | 1.5 | 25 | N/A | | | | | |
| 12:41 | 1.5 | 25 | N/A | | | | | |
| 12:44 | 2.0 | 25 | N/A | | | | | |
| 12:47 | 2.2 | 25 | N/A | | | | | |
| 12:50 | 2.2 | 25 | N/A | | | | | |
| 12:53 | 2.2 | 25 | N/A | | | | | |
| 12:56 | 3.3 | 50 | N/A | | | | | |
| 12:59 | 3.3 | 50 | N/A | | | | | |
| 13:02 | 3.3 | 50 | N/A | | | | | |
| 13:05 | 4.1 | 75 | N/A | | | | | |
| 13:08 | 4.1 | 75 | N/A | | | | | |
| 13:11 | 4.2 | 75 | N/A | | | | | |
| 13:14 | 4.7 | 100 | N/A | | | | | |
| 13:17 | 4.7 | 100 | N/A | | | | | |
| 13:20 | 4.7 | 100 | N/A | | | | | |
| Test Complete per Ken Davis | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |

## WELL INJECTION TEST RECORD

| | | | | | |
|---|---|---|---|---|---|
| DATE | 10/23/2012 | TIME | 9:00 | WELL ID | MW-513 |
| ADJ WELL | MW-511 | TECH | J. Brownfield | RECD BY | T. Mills |

| TIME | FLOW (gpm) | PRESS (psi) | DTW Adj Well | | TIME | FLOW | PRESS | DTW Adj Well |
|---|---|---|---|---|---|---|---|---|
| 9:30 | 1.5 | 25 | 7.48 | | | | | |
| 9:33 | 0.5 | 25 | 7.48 | | | | | |
| 9:36 | 0.7 | 25 | 6.03 | | | | | |
| 9:39 | 0.9 | 25 | 5.96 | | | | | |
| 9:42 | 1.0 | 25 | 5.90 | | | | | |
| 9:45 | 1.0 | 25 | 5.89 | | | | | |
| 9:48 | 1.0 | 25 | 5.87 | | | | | |
| 9:51 | 1.9 | 50 | 5.81 | | | | | |
| 9:54 | 1.9 | 50 | 5.81 | | | | | |
| Test Paused Due To Equipment Issue | | | | | | | | |
| 10:10 | 1.9 | 50 | 5.97 | | | | | |
| 10:13 | 2.0 | 50 | 5.97 | | | | | |
| 10:16 | 2.1 | 50 | 6.01 | | | | | |
| 10:19 | 3.0 | 75 | 5.27 | | | | | |
| 10:22 | 3.0 | 75 | 4.11 | | | | | |
| 10:25 | 3.1 | 75 | 0.00 | | | | | |
| Test Complete per Ken Davis | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

# WELL INJECTION TEST RECORD

| | | | | | |
|---|---|---|---|---|---|
| DATE | 10/23/2012 | TIME | 15:05 | WELL ID | MW-514 |
| ADJ WELL | MW-515 MW-516 | TECH | J. Brownfield | RECD BY | T. Mills |

| TIME | FLOW (gpm) | PRESS (psi) | DTW Adj Well | | TIME | FLOW | PRESS | DTW Adj Well |
|---|---|---|---|---|---|---|---|---|
| 15:10 | 2.3 | 25 | 1.20/14.28 | | | | | |
| 15:13 | 2.3 | 25 | 0.0/13.27 | | | | | |
| 15:16 | 2.3 | 25 | 0.0/12.91 | | | | | |
| 15:19 | 2.4 | 50 | 0.0/12.67 | | | | | |
| 15:22 | 2.4 | 50 | 0.0/12.42 | | | | | |
| 15:25 | 2.5 | 50 | 0.0/12.29 | | | | | |
| 15:28 | 3.1 | 75 | 0.0/11.99 | | | | | |
| 13:31 | 3.1 | 75 | 0.0/11.93 | | | | | |
| 15:34 | 3.1 | 75 | 0.0/11.86 | | | | | |
| 15:37 | 3.4 | 100 | 0.0/11.78 | | | | | |
| 15:40 | 3.4 | 100 | 0.0/11.76 | | | | | |
| 15:43 | 3.4 | 100 | 0.0/11.74 | | | | | |
| Test Complete Per Ken Davis | | | | | | | | |
| | | | | | | | | |
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# WELL INJECTION TEST RECORD

| | | | | | |
|---|---|---|---|---|---|
| DATE | 10/23/2012 | TIME | 13:35 | WELL ID | MW-515 |
| ADJ WELL | MW-514 MW-516 | TECH | J. Brownfield | RECD BY | T. Mills |

| TIME | FLOW (gpm) | PRESS (psi) | DTW Adj Well | | TIME | FLOW | PRESS | DTW Adj Well |
|---|---|---|---|---|---|---|---|---|
| 13:38 | 2.5 | 25 | 8.49/22.31 | | | | | |
| 13:41 | 1.7 | 25 | 8.37/20.91 | | | | | |
| 13:44 | 1.6 | 25 | 5.95/20.98 | | | | | |
| 13:47 | 1.7 | 25 | 0.0/21.46 | | | | | |
| 13:50 | 2.8 | 50 | 0.0/21.62 | | | | | |
| 13:53 | 2.9 | 50 | 0.0/21.73 | | | | | |
| 13:56 | 2.9 | 50 | 0.0/21.82 | | | | | |
| 13:59 | 3.8 | 75 | 0.0/21.90 | | | | | |
| 14:02 | 3.7 | 75 | 0.0/21.98 | | | | | |
| 14:05 | 3.7 | 75 | 0.0/22.02 | | | | | |
| 14:08 | 4.5 | 100 | 0.0/22.10 | | | | | |
| 14:11 | 4.5 | 100 | 0.0/22.14 | | | | | |
| 14:14 | 4.5 | 100 | 0.0/22.16 | | | | | |
| Test Complete per Ken Davis | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |

# WELL INJECTION TEST RECORD

| | | | | | |
|---|---|---|---|---|---|
| DATE | 10/23/2012 | TIME | 14:20 | WELL ID | MW-516 |
| ADJ WELL | MW-515 MW-514 | TECH | J. Brownfield | RECD BY | T. Mills |

| TIME | FLOW (gpm) | PRESS (psi) | DTW Adj Well | | TIME | FLOW | PRESS | DTW Adj Well |
|---|---|---|---|---|---|---|---|---|
| 14:20 | 2.0 | 25 | 4.21/5.25 | | | | | |
| 14:23 | 1.9 | 25 | 0.0/0.81 | | | | | |
| 14:26 | 1.9 | 25 | 0.0/0.81 | | | | | |
| 14:29 | 1.9 | 25 | 0.0/0.79 | | | | | |
| 14:32 | 3.1 | 50 | 0.0/0.80 | | | | | |
| 14:35 | 3.1 | 50 | 0.0/0.84 | | | | | |
| 14:38 | 3.1 | 50 | 0.0/0.85 | | | | | |
| 14:41 | 3.1 | 75 | 0.0/0.81 | | | | | |
| 14:44 | 3.1 | 75 | 0.0/<0.70 | | | | | |
| 14:47 | 3.1 | 75 | 0.0/<0.50 | | | | | |
| 14:50 | 3.3 | 100 | 0.0/0.0 | | | | | |
| 14:53 | 3.3 | 100 | 0.0/0.0 | | | | | |
| 14:56 | 4.3 | 100 | 0.0/0.0 | | | | | |
| 14:59 | 4.3 | 100 | 0.0/0.0 | | | | | |
| 15:02 | 4.3 | 100 | 0.0/0.0 | | | | | |
| Test Complete Per Ken Davis | | | | | | | | |
| | | | | | | | | |
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# APPENDIX G

# SUMMARY OF SOILS VOC DATA FOR SWMU 211-B

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**Summary of Soils VOC Data for SWMU 211-B**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-001 | 10/9/2012 | 4.9 | 27 | | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 8.5 | **78** | | 1.8 | U | 0.71 | J | 1.1 | U | 0.49 | U |
| | | 10.5 | **150** | | 1.6 | U | 0.78 | J | 0.93 | U | 0.42 | U |
| | | (10.5)DUP | **100** | | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 19.5 | **91** | | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 23 | **1,700** | | 22 | U | 9.5 | U | 7.4 | U | 25 | U |
| | | 25.1 | 19 | | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 34 | 15 | | 2 | U | 0.74 | U | 1.2 | U | 0.53 | U |
| | | 39.5 | **93** | | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 44 | **310** | | 25 | U | 11 | U | 8.3 | U | 28 | U |
| | | 49.5 | 61 | | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 53 | **84** | | 1.8 | U | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 55.5 | 24 | | 2 | U | 0.73 | U | 1.1 | U | 0.52 | U |
| | | 60.5 | 1.2 | J | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | Average | | **197** | | *** | | 1 | | *** | | *** | |
| 211-B-002 | 10/10/2012 | 3 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 9 | 0.36 | U | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 14 | 0.35 | U | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 18.5 | 2.2 | J | 2.1 | U | 0.77 | U | 1.2 | U | 0.55 | U |
| | | 21 | **170** | J | 23 | U | 9.8 | U | 7.6 | U | 26 | U |
| | | 29 | 1.8 | J | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 31.5 | 52 | | 1.8 | U | 0.68 | U | 1.1 | U | 0.49 | U |
| | | 35.5 | **210** | | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 44.5 | **93** | | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 47.5 | 23 | | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 50.5 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 59.5 | 4.1 | J | 1.9 | U | 0.72 | U | 1.1 | U | 0.52 | U |
| | | 62.5 | 1.8 | J | 2.1 | U | 0.78 | U | 1.2 | U | 0.56 | U |
| | Average | | 43 | | *** | | *** | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-003 | 10/10/2012 | 4 | 0.41 | U | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 9 | 0.41 | U | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 14.5 | 1 | J | 1.6 | U | 0.6 | U | 0.93 | U | 0.43 | U |
| | | 19.5 | 0.46 | J | 1.4 | U | 0.51 | U | 0.8 | U | 0.37 | U |
| | | (19.5)DUP | 0.5 | J | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 23 | 0.35 | U | 1.4 | U | 0.54 | U | 0.84 | U | 0.38 | U |
| | | 28.5 | 0.33 | U | 1.4 | U | 0.51 | U | 0.79 | U | 0.36 | U |
| | | 34 | 0.87 | J | 1.3 | U | 0.5 | U | 0.78 | U | 0.36 | U |
| | | 39 | 17 | | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 40.5 | 19 | | 1.4 | U | 0.51 | U | 0.8 | U | 0.37 | U |
| | | | | | | | | | | | | |
| | | 49.5 | 17 | | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 52 | 61 | | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 58.5 | 9 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | Average | | 10 | | *** | | *** | | *** | | *** | |
| 211-B-004 | 10/11/2012 | 3.5 | 12 | | 1.4 | U | 1.4 | J | 0.8 | U | 0.37 | U |
| | | 7 | 30 | | 1.6 | U | 20 | | 0.93 | U | 0.42 | U |
| | | 14.5 | **1,800** | | 25 | U | 66 | J | 8.3 | U | 28 | U |
| | | 17.5 | 72 | | 1.6 | U | 4.2 | J | 0.96 | U | 0.44 | U |
| | | 20.1 | **380** | | 25 | U | 11 | U | 8.5 | U | 29 | U |
| | | 25.5 | **920** | | 21 | U | 9 | U | 7 | U | 24 | U |
| | | 30.1 | **900** | | 27 | U | 11 | U | 8.9 | U | 30 | U |
| | | 35.1 | **250** | | 24 | U | 10 | U | 7.9 | U | 27 | U |
| | | 41 | **620** | | 24 | U | 10 | U | 8 | U | 27 | U |
| | | 49.9 | **270** | | 23 | U | 9.8 | U | 7.7 | U | 26 | U |
| | | 51 | 19 | U | 26 | U | 11 | U | 8.8 | U | 30 | U |
| | | 55.1 | 75 | | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 62 | **100** | J | 23 | U | 10 | U | 7.8 | U | 26 | U |
| | Average | | **418** | | *** | | 10 | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-005 | 10/15/2012 | 4.9 | 46 | | 1.8 | U | 6.8 | J | 1 | U | 0.47 | U |
| | | 5.1 | 71 | | 1.7 | U | 8.3 | J | 0.97 | U | 0.45 | U |
| | | 13.5 | **340** | | 26 | U | 11 | U | 8.6 | U | 29 | U |
| | | 18 | **130** | | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 23 | **3,100** | | 24 | U | 10 | U | 7.9 | U | 27 | U |
| | | (29.5)DUP | **2,900** | | 33 | U | 14 | U | 11 | U | 38 | U |
| | | 29.5 | **700** | | 23 | U | 10 | U | 7.9 | U | 27 | U |
| | | 30.5 | **1,400** | | 32 | U | 14 | U | 11 | U | 36 | U |
| | | 35.5 | **380** | | 26 | U | 11 | U | 8.6 | U | 29 | U |
| | | 40.5 | **1,500** | | 28 | U | 12 | U | 9.6 | U | 32 | U |
| | | 48 | **690** | | 23 | U | 10 | U | 7.8 | U | 26 | U |
| | | 50.5 | **360** | | 26 | U | 11 | U | 8.7 | U | 30 | U |
| | | 59 | **340** | | 25 | U | 11 | U | 8.5 | U | 29 | U |
| | | 60.1 | **120** | J | 46 | U | 20 | U | 15 | U | 52 | U |
| | | Average | **863** | | *** | | 6 | | *** | | *** | |
| 211-B-006 | 10/15/2012 | 4.5 | 0.41 | U | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 9 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 13.5 | 4.7 | J | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 17.5 | 29 | | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 21 | **92** | | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 29.5 | 25 | | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 31 | 3.3 | J | 2 | U | 0.73 | U | 1.1 | U | 0.52 | U |
| | | 37.5 | 4 | J | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 44.9 | 14 | | 1.6 | U | 0.59 | U | 0.93 | U | 0.43 | U |
| | | 49.5 | 11 | | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | | 52.5 | 7.6 | J | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 59 | 1.2 | J | 1.7 | U | 0.65 | U | 1 | U | 0.46 | U |
| | | 62 | 0.47 | U | 1.9 | U | 0.73 | U | 1.1 | U | 0.52 | U |
| | | Average | 15 | | *** | | *** | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-007 | 10/16/2012 | 2.5 | 0.35 | U | 1.4 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 5.5 | 0.32 | U | 1.3 | U | 0.49 | U | 0.77 | U | 0.35 | U |
| | | 11 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 17.5 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 23 | 0.98 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | (23)DUP | 0.73 | J | 1.4 | U | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 25.1 | 0.51 | J | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 33.5 | 15 | | 1.6 | U | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 35.5 | 7.4 | J | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 44.5 | 9.7 | J | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 49 | 0.35 | U | 1.4 | U | 0.54 | U | 0.84 | U | 0.39 | U |
| | | 53.5 | 7.3 | J | 1.7 | U | 0.64 | U | 0.99 | U | 0.46 | U |
| | | 55.1 | 6.3 | J | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 60.1 | 5.1 | J | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | Average | | 4 | | *** | | *** | | *** | | *** | |
| 211-B-008 | 10/9/2012 | 0.5 | 0.42 | U | 1.7 | U | 0.65 | U | 1 | U | 0.46 | U |
| | | (8)DUP | 0.37 | U | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 8 | 0.39 | U | 1.6 | U | 0.6 | U | 0.95 | U | 0.43 | U |
| | | 12.5 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 16.5 | 0.35 | U | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 24 | 5.2 | J | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 28.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 32 | 0.41 | U | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 37 | 0.39 | U | 1.6 | U | 0.61 | U | 0.95 | U | 0.43 | U |
| | | 40.1 | 0.4 | U | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 48 | 0.37 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 50.5 | 0.41 | U | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 58.5 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 62.5 | 0.43 | U | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | Average | | 0.6 | | *** | | *** | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-009 | 10/8/2012 | 4 | 3 | J | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 6.5 | 3.5 | J | 1.8 | U | 0.65 | U | 1 | U | 0.47 | U |
| | | 14.5 | 10 | | 1.6 | U | 0.87 | J | 0.92 | U | 0.42 | U |
| | | 16 | 8.4 | J | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 22 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 28.5 | 1.9 | J | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | (34.5)DUP | 0.46 | U | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 34.5 | 0.4 | U | 1.7 | U | 0.62 | U | 0.98 | U | 0.45 | U |
| | | 36 | 0.35 | U | 1.4 | U | 0.54 | U | 0.84 | U | 0.39 | U |
| | | 44 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 49.5 | 0.41 | U | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 51.5 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 59.5 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 62 | 0.4 | U | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | Average | 2 | | *** | | 0.3 | | *** | | *** | |
| 211-B-010 | 10/5/2012 | 4 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 9.9 | 2.1 | J | 1.7 | U | 0.62 | U | 0.97 | U | 0.44 | U |
| | | 14 | 8.4 | J | 1.5 | U | 0.63 | J | 0.86 | U | 0.39 | U |
| | | 16 | 1.7 | J | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 20.5 | 2.4 | J | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 28.5 | 9.7 | J | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 31 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 39 | 2.3 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.4 | U |
| | | 41 | 3.2 | J | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 46 | 3 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 51.5 | 4 | J | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 59.5 | 1.7 | J | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 62 | 0.62 | J | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | Average | 3 | | *** | | 0.3 | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-011 | 10/8/2012 | 4 | 0.41 | U | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 9 | 4.3 | J | 1.8 | U | 0.67 | U | 1.1 | U | 0.48 | U |
| | | 14.5 | 15 | | 1.4 | U | 0.54 | U | 0.84 | U | 0.38 | U |
| | | 19.5 | 12 | | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 20.5 | 15 | | 1.3 | U | 0.5 | U | 0.78 | U | 0.36 | U |
| | | (20.5)DUP | 5.8 | J | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 29.5 | 1.6 | J | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 32 | 0.36 | U | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 39 | 0.84 | J | 1.6 | U | 0.59 | U | 0.92 | U | 0.42 | U |
| | | 44 | 1.5 | J | 1.5 | U | 0.56 | U | 0.87 | U | 0.4 | U |
| | | 45.1 | 2.4 | J | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 51 | 2.2 | J | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 59 | 0.39 | U | 1.6 | U | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 64.9 | 2 | J | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | Average | | 5 | | *** | | *** | | *** | | *** | |
| 211-B-012 | 10/4/2012 | 2 | 0.38 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | | 5.5 | 0.38 | U | 1.6 | U | 0.58 | U | 0.92 | U | 0.42 | U |
| | | 10.1 | 0.4 | U | 1.7 | U | 0.62 | U | 0.96 | U | 0.44 | U |
| | | 15.1 | 0.34 | U | 1.4 | U | 0.52 | U | 0.82 | U | 0.38 | U |
| | | 23.5 | 0.43 | U | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | | 29.5 | 0.36 | U | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 32 | 0.89 | J | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 39 | 4.6 | J | 1.9 | U | 0.7 | U | 1.1 | U | 0.5 | U |
| | | 40.1 | 5.9 | J | 1.5 | U | 0.54 | U | 0.85 | U | 0.39 | U |
| | | 49.9 | 0.39 | U | 1.6 | U | 0.6 | U | 0.93 | U | 0.43 | U |
| | | 50.5 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 59 | 0.43 | U | 1.8 | U | 0.66 | U | 1 | U | 0.47 | U |
| | | 61 | 0.39 | U | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | Average | | 1.0 | | *** | | *** | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | 1,1-DCE [µg/kg] | *cis*-1,2-DCE [µg/kg] | *trans*-1,2-DCE [µg/kg] | VC [µg/kg] |
|---|---|---|---|---|---|---|---|
| 211-B-013 | 10/4/2012 | 1.5 | 0.38 U | 1.6 U | 0.58 U | 0.91 U | 0.42 U |
| | | 9 | 0.41 U | 1.7 U | 0.63 U | 0.98 U | 0.45 U |
| | | 14 | 0.44 U | 1.8 U | 0.67 U | 1.1 U | 0.48 U |
| | | (16)DUP | 0.39 U | 1.6 U | 0.6 U | 0.95 U | 0.43 U |
| | | 16 | 0.43 U | 1.8 U | 0.66 U | 1 U | 0.48 U |
| | | 21 | 0.47 U | 1.9 U | 0.72 U | 1.1 U | 0.52 U |
| | | 28 | 0.33 U | 1.4 U | 0.51 U | 0.8 U | 0.37 U |
| | | 30.1 | 0.35 U | 1.5 U | 0.54 U | 0.85 U | 0.39 U |
| | | 36.5 | 0.35 U | 1.4 U | 0.54 U | 0.84 U | 0.38 U |
| | | 43.5 | 1.2 J | 1.5 U | 0.57 U | 0.9 U | 0.41 U |
| | | 48 | 0.31 U | 1.3 U | 0.47 U | 0.74 U | 0.34 U |
| | | 50.1 | 0.42 U | 1.7 U | 0.64 U | 1 U | 0.46 U |
| | | 59.5 | 0.37 U | 1.5 U | 0.57 U | 0.89 U | 0.41 U |
| | | 61.5 | 0.39 U | 1.6 U | 0.61 U | 0.95 U | 0.43 U |
| | Average | | 0.3 | *** | *** | *** | *** |
| 211-B-015 | 10/16/2012 | 3 | 1.6 J | 1.9 U | 4.5 J | 1.1 U | 0.5 U |
| | | 5.1 | 2.2 J | 1.7 U | 2.5 J | 0.98 U | 0.45 U |
| | | 13.5 | 4.9 J | 1.6 U | 0.73 J | 0.93 U | 0.43 U |
| | | 19.9 | 1 J | 1.5 U | 0.56 U | 0.87 U | 0.4 U |
| | | 21.5 | **170** | 1.5 U | 6.1 J | 0.85 U | 0.39 U |
| | | 29.5 | **120** | 1.5 U | 4.7 J | 0.86 U | 0.39 U |
| | | 30.5 | 5.4 J | 2 U | 0.74 U | 1.2 U | 0.53 U |
| | | 37 | 5.5 J | 1.4 U | 0.53 U | 0.84 U | 0.38 U |
| | | 41.5 | 37 | 1.7 U | 0.91 J | 0.98 U | 0.45 U |
| | | 48.5 | 17 | 1.5 U | 0.57 U | 0.9 U | 0.41 U |
| | | 52 | 39 | 1.7 U | 0.63 U | 0.99 U | 0.45 U |
| | | 56 | 42 | 1.7 U | 0.63 U | 0.99 U | 0.45 U |
| | | 60.5 | 67 | 1.6 U | 0.61 U | 0.95 U | 0.43 U |
| | Average | | 39 | *** | 2 | *** | *** |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-016 | 10/17/2012 | 1 | 0.43 | U | 1.8 | U | 0.65 | U | 1 | U | 0.47 | U |
| | | 5.1 | 0.43 | U | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | | 14 | 7.7 | J | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | (16)DUP | 0.33 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 16 | 3 | J | 1.6 | U | 0.6 | U | 0.93 | U | 0.43 | U |
| | | 21.5 | 19 | | 1.4 | U | 0.52 | U | 0.82 | U | 0.37 | U |
| | | 29.5 | 23 | | 1.5 | U | 1.1 | J | 0.88 | U | 0.4 | U |
| | | 33.5 | 16 | | 1.8 | U | 0.87 | J | 1 | U | 0.47 | U |
| | | 36.5 | 18 | | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 43.5 | 23 | | 1.6 | U | 0.58 | U | 0.91 | U | 0.42 | U |
| | | 48.5 | 31 | | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 50.1 | 42 | | 1.8 | U | 0.67 | U | 1 | U | 0.48 | U |
| | | 55.1 | 20 | | 1.8 | U | 0.69 | U | 1.1 | U | 0.49 | U |
| | | 60.1 | 4.3 | J | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | Average | | 15 | | *** | | 0.4 | | *** | | *** | |
| 211-B-017 | 10/17/2012 | 4 | 6.1 | J | 1.5 | U | 2.4 | J | 0.89 | U | 0.41 | U |
| | | 8 | 26 | | 1.7 | U | 1.3 | J | 0.97 | U | 0.44 | U |
| | | 14 | 28 | | 1.8 | U | 0.69 | U | 1.1 | U | 0.49 | U |
| | | 16 | 13 | | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 23.5 | 13 | | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 29.9 | 16 | | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 30.5 | 39 | | 2 | U | 0.73 | U | 1.1 | U | 0.53 | U |
| | | 35.1 | 8.9 | J | 1.7 | U | 0.63 | U | 0.98 | U | 0.45 | U |
| | | 44.5 | **120** | | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 48 | 37 | | 1.6 | U | 0.61 | U | 0.96 | U | 0.44 | U |
| | | 52 | 20 | | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 56 | 3.4 | J | 1.8 | U | 0.69 | U | 1.1 | U | 0.49 | U |
| | | 62.5 | 0.38 | U | 1.6 | U | 0.59 | U | 0.93 | U | 0.42 | U |
| | Average | | 25 | | *** | | 0.6 | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-018 | 10/18/2012 | 3.5 | 2.5 | J | 1.7 | U | 0.62 | U | 0.97 | U | 0.45 | U |
| | | 4.9 | 3.3 | J | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 14 | 0.59 | J | 1.4 | U | 0.53 | U | 0.83 | U | 0.38 | U |
| | | 19.5 | 0.36 | U | 1.5 | U | 0.55 | U | 0.86 | U | 0.39 | U |
| | | 21 | 28 | | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 28 | 13 | | 2 | U | 0.76 | U | 1.2 | U | 0.54 | U |
| | | 30.1 | 2.2 | J | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 37.5 | 1.9 | J | 1.7 | U | 0.63 | U | 0.99 | U | 0.45 | U |
| | | 40.5 | 2 | J | 1.7 | U | 0.62 | U | 0.97 | U | 0.45 | U |
| | | 47.5 | 0.37 | U | 1.5 | U | 0.57 | U | 0.9 | U | 0.41 | U |
| | | 53.5 | 0.46 | U | 1.9 | U | 0.71 | U | 1.1 | U | 0.51 | U |
| | | 58 | 0.38 | U | 1.6 | U | 0.58 | U | 0.91 | U | 0.41 | U |
| | | 60.1 | 0.82 | U | 3.4 | U | 1.3 | U | 2 | U | 0.9 | U |
| | Average | | 4 | | *** | | *** | | *** | | *** | |
| 211-B-019 | 10/18/2012 | 2.5 | 10 | | 1.5 | U | 1 | J | 0.9 | U | 0.41 | U |
| | | (2.5)DUP | 6.7 | J | 1.7 | U | 0.66 | J | 1 | U | 0.46 | U |
| | | 9.5 | 28 | | 1.5 | U | 7 | J | 0.9 | U | 0.41 | U |
| | | 12 | **110** | | 1.8 | U | 26 | | 1.1 | U | 0.49 | U |
| | | 19.5 | 3.2 | J | 1.3 | U | 0.5 | U | 0.78 | U | 0.36 | U |
| | | 23 | **2,700** | | 22 | U | 9.3 | U | 7.3 | U | 25 | U |
| | | 25.1 | **13,000** | | 54 | U | 23 | U | 18 | U | 62 | U |
| | | 32 | **170** | | 1.4 | U | 2.4 | J | 0.82 | U | 0.37 | U |
| | | 37 | **100** | | 1.4 | U | 1.4 | J | 0.84 | U | 0.38 | U |
| | | 40.5 | **170** | | 1.9 | U | 1.6 | J | 1.1 | U | 0.52 | U |
| | | 45.1 | **130** | | 1.5 | U | 0.58 | J | 0.87 | U | 0.4 | U |
| | | 54 | 44 | | 1.5 | U | 0.57 | U | 0.89 | U | 0.41 | U |
| | | 58 | 22 | | 1.5 | U | 0.56 | U | 0.88 | U | 0.4 | U |
| | | 64.5 | 0.46 | U | 1.9 | U | 0.71 | U | 1.1 | U | 0.51 | U |
| | Average | | **1,178** | | *** | | 4 | | *** | | *** | |

**Summary of Soils VOC Data for SWMU 211-B (Continued)**

| Station | Date Collected | Sample Depth [ft bls] | TCE [µg/kg] | | 1,1-DCE [µg/kg] | | *cis*-1,2-DCE [µg/kg] | | *trans*-1,2-DCE [µg/kg] | | VC [µg/kg] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-B-020 | 10/19/2012 | 4 | 4.2 | J | 1.7 | U | 0.64 | U | 1 | U | 0.46 | U |
| | | 9 | 6.2 | J | 1.7 | U | 0.65 | U | 1 | U | 0.47 | U |
| | | 13.5 | 12 | | 1.8 | U | 0.66 | U | 1 | U | 0.48 | U |
| | | 19.5 | 36 | | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 22 | 20 | | 1.5 | U | 0.55 | U | 0.86 | U | 0.4 | U |
| | | 28 | 12 | | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 30.1 | 0.34 | U | 1.4 | U | 0.52 | U | 0.81 | U | 0.37 | U |
| | | 39.5 | 9.2 | J | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 40.1 | 12 | | 1.6 | U | 0.6 | U | 0.94 | U | 0.43 | U |
| | | 48.5 | 12 | | 1.6 | U | 0.61 | U | 0.95 | U | 0.44 | U |
| | | 50.5 | 7.3 | J | 1.5 | U | 0.58 | U | 0.9 | U | 0.41 | U |
| | | 59.5 | 1.6 | J | 1.5 | U | 0.55 | U | 0.87 | U | 0.4 | U |
| | | 61 | 4.6 | J | 1.8 | U | 0.67 | U | 1.1 | U | 0.48 | U |
| | Average | | 11 | | *** | | *** | | *** | | *** | |

Notes:

1. Groundwater Protection Remediation Goals from Remedial Design Work Plan for Solid Waste Management Units 1, 211-A, and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, (DOE 2012a).
2. J - Indicates an estimated value.
3. U - Compound analyzed for but not detected at or below the lowest concentration reported.
4. DUP - Indicated that a duplicate sample was taken for the interval given in parentheses.
5. Sample depth represents the discrete depth at which an EnCore® sample was taken.
6. For "U" qualified samples a value of one half the concentration reported was used in calculating the average borehole concentration.
7. *** - Indicates average concentration not calculated as all boring samples were "U" qualified for specific VOC.
8. Yellow shading and bold text indicate an exceedance of Groundwater Protection Remediation Goals.
9. Soil boring 211-B-014 was collected and archived.  Boring was not logged or screened for VOC impacts.

# APPENDIX H

# ADDENDUM TO THE FINAL CHARACTERIZATION REPORT FOR SOLID WASTE MANAGEMENT UNITS 211-A AND 211-B VOLATILE ORGANIC COMPOUND SOURCES FOR THE SOUTHWEST GROUNDWATER PLUME AT THE PADUCAH GASEOUS DIFFUSION PLANT

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# CONTENTS

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## TABLES



## FIGURE

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# ACRONYMS

| | |
|---|---|
| CME | Central Mine Equipment |
| CSM | conceptual site model |
| DNAPL | dense nonaqueous-phase liquid |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| FCR | final characterization report |
| FFA | Federal Facility Agreement |
| HSA | hollow-stem auger |
| KDWM | Kentucky Division of Waste Management |
| LATA Kentucky | LATA Environmental Services of Kentucky, LLC |
| LUC | land use control |
| PEGASIS | PPPO Environmental Geographic Analytical Spatial Information System |
| RDSI | remedial design support investigation |
| RDWP | remedial design work plan |
| RGA | Regional Gravel Aquifer |
| ROD | record of decision |
| SWMU | solid waste management unit |
| UCRS | Upper Continental Recharge System |
| VOC | volatile organic compound |

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# H.1. PROJECT DESCRIPTION

Solid Waste Management Units (SWMUs) 211-A and 211-B are areas of trichloroethene (TCE) contamination in soil to a depth of 65 ft on the north and south sides of the C-720 Maintenance and Stores Building. Identified remedies for SWMUs 211-A and 211-B in the Record of Decision (ROD) (DOE 2012) are *in situ* source treatment using enhanced *in situ* bioremediation with interim land use controls (LUCs) and long-term monitoring (Alternative 8) or long-term monitoring with interim LUCs (Alternative 2). The U.S. Department of Energy (DOE) issued a letter notification, *Final Characterization Notification for Solid Waste Management Unit 211-A and Solid Waste Management Unit 211-B at the Paducah Gaseous Diffusion Plant, Paducah Kentucky*, PPPO-02-1979222-13B, on July 10, 2013 (Blumenfeld 2013). This Final Characterization Notification identified DOE's recommendation for the remedy selection of SWMUs 211-A and 211-B as long-term monitoring with interim LUCs (Alternative 2). The recommendation was based on the results of a Remedial Design Support Investigation (RDSI) of SWMUs 211-A and 211-B that were summarized in *Final Characterization Report for Solid Waste Management Units 211-A and 211-B Volatile Organic Compound Sources for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1288&D2 (FCR) (DOE 2013a).

The U.S. Environmental Protection Agency (EPA) requested additional groundwater data for the Regional Gravel Aquifer (RGA) to support the basis for the final selected remedy (Tufts 2013).[1] EPA issued an additional work request (Tufts 2014), as provided in the Paducah Gaseous Diffusion Plant Federal Facility Agreement (FFA), to collect the additional groundwater data as a follow-on phase of the SWMUs 211-A and 211-B RDSI. Negotiations among DOE, Kentucky Division of Waste Management (KDWM), and EPA followed to determine the type and location of groundwater sampling required to address the remaining concern. The resulting sampling and analysis plan is documented in the Appendix C Addendum of the Remedial Design Work Plan (RDWP) for SWMUs 211-A and 211-B (DOE 2015). LATA Environmental Services of Kentucky, LLC, (LATA Kentucky) and its subcontractors performed sampling for this phase of the SWMUs 211-A and 211-B RDSI during the period June 22, 2015, through July 1, 2015.

The following decision rules and guidelines for evaluating the results of the RGA groundwater investigation are documented in the Appendix C sampling and analysis plan of the Addendum to the RDWP (DOE 2015).

For SWMU 211-A, in the upper or middle RGA (in the zone of higher TCE):

- **IF** the average of downgradient minus upgradient TCE levels is less than approximately 400 ppb, **THEN** the conceptual site model (CSM) and the predicted TCE mass in the Upper Continental Recharge System (UCRS) are confirmed. The remedial action will be implementation of long-term monitoring with interim LUCs.

- **IF** the average of downgradient minus upgradient TCE levels is greater than approximately 400 ppb and less than 11,000 ppb, **THEN** the CSM is valid, but the TCE mass in the UCRS is greater than estimated. The remedial action will be implementation of enhanced bioremediation with interim LUCs and long-term monitoring.

[1] The KDWM accepted DOE's recommendation in the Final Characterization Notification (letter from April Webb to Rachel Blumenfeld, dated December 17, 2013).

For SWMU 211-A, if investigation results indicate substantial contamination throughout the RGA in the downgradient location only, dispersed dense nonaqueous-phase liquid (DNAPL) ganglia are present throughout the RGA. The CSM is invalid. The FFA parties will confer to evaluate the impact of the discovered DNAPL.

For SWMU 211-B, in the upper or middle RGA (in the zone of higher TCE), where upgradient TCE levels are assumed to be negligible:

- **IF** the average of TCE levels beneath SWMU 211-B is less than approximately 400 ppb, **THEN** the CSM and the predicted TCE mass in the UCRS is confirmed. The remedial action will be implementation of long-term monitoring with interim LUCs.

- **IF** the average of TCE levels beneath SWMU 211-B is greater than approximately 400 ppb and less than 11,000 ppb, **THEN** the CSM is valid, but the TCE mass in the UCRS is greater than estimated. The remedial action will be implementation of enhanced bioremediation with interim LUCs and long-term monitoring.

For SWMU 211-B, if investigation results indicate substantial contamination in the upper or middle RGA, DNAPL may be present in either the UCRS or the RGA. The CSM is invalid, and the FFA parties will confer to evaluate the impact of the potential DNAPL.

Moreover, for SWMU 211-B, if investigation results indicate substantial contamination in the lower RGA only, an upgradient source is impacting TCE levels beneath the SWMU. The CSM may be invalid. The FFA parties will confer to evaluate the impact of the upgradient source.

DOE will evaluate the data and prepare a revised letter notification identifying DOE’s recommendation for final remedy selection for SWMUs 211-A and 211-B.

## H.2. CONCEPTUAL SITE MODELS

DOE completed RDSI activities to characterize the concentration and extent of TCE [and related volatile organic compounds (VOCs)] in soils of the UCRS and upper RGA to a depth of approximately 65 ft over the period August 2012 through March 2013. The FCR (DOE 2013a) results are the basis of the revised CSM applicable to development of this investigation’s decision rules. In the investigation results and the CSM, SWMU 211-A consists of a broad area with soil remediation goal exceedances (depth-average TCE concentration in soil greater than 75 µg/kg) in the UCRS, covering approximately 34,000 $ft^2$ laterally with a depth interval of 6 to 65.1 ft below ground surface (bgs). The combined volume (mass) estimate of TCE in SWMU 211-A ranges from 0.2 gal (1 kg) to 2.2 gal (12 kg). Additional dissolved TCE concentrations derived from SWMU 211-A are not expected to exceed 400 ppb in the RGA on the downgradient side of SWMU 211-A.

The CSM for SWMU 211-B consists of a single area in the UCRS with soil remediation goal exceedances covering approximately 3,000 $ft^2$ laterally with a depth interval of 8.5 ft bgs to 64.5 ft bgs. The TCE volume (mass) estimate for SWMU 211-B ranges from 0.1 gal (0.6 kg) to 0.8 gal (4 kg). The dissolved TCE concentrations derived from SWMU 211-B are not expected to exceed 400 ppb in the upper and middle RGA below SWMU 211-B.

General groundwater flow is northward in the areas of SWMUs 211-A and 211-B. The upgradient side is anticipated to be the south side of SWMUs 211-A and 211-B: the downgradient side is anticipated to be the north side of SWMUs 211-A and 211-B.

# H.3. GROUNDWATER SAMPLING STRATEGY

For the 2015 RDSI groundwater investigation, the general strategy for SWMU 211-A was to characterize dissolved TCE concentrations throughout the thickness of the RGA in upgradient and downgradient locations to assess the downgradient impact of the SWMU. At SWMU 211-B, where upgradient dissolved TCE levels were assumed to be negligible and the near-downgradient area was inaccessible because of the presence to the C-720 Building, the general strategy was to characterize dissolved TCE concentrations throughout the thickness of the RGA immediately below the SWMU. The Addendum to the RDWP (DOE 2015) identified five locations to sample around SWMU 211-A, based on perceived upgradient and downgradient relationships, and one location to sample within SWMU 211-B.

Previous UCRS soil sampling and analysis as part of the SWMUs 211-A and 211-B RDSI of 2012 and 2013 characterized TCE levels from near surface to a depth of approximately 65 ft bgs. The 2015 RDSI sampled and analyzed dissolved TCE levels in RGA groundwater beginning at a depth of 65 ft bgs and continuing in 5-ft intervals to the base of the RGA, found at depths between 90 ft bgs and 100 ft bgs.

The sampling and analysis plan identified the use of direct push technology (DPT) to collect the groundwater samples, unless proven ineffective. A small-diameter, hollow-stem auger (HSA) system was the back-up sampling approach. Groundwater samples were analyzed for TCE and the related VOCs 1,1-dichloroethene (DCE) (1,1-DCE); *cis*-1,2-DCE; *trans*-1,2-DCE; and vinyl chloride.

# H.4. INVESTIGATION

The investigation fieldwork was completed primarily during the two weeks beginning June 22, 2015, and June 29, 2015, which was a scheduled break in the then current phase of field investigation of SWMU 4. Sampling efforts for the SWMU 4 investigation previously had documented that DPT was ineffective for sampling groundwater through the RGA. (The DPT rig, using a dual-tube sampling system, was able to penetrate to the base of the RGA, but the penetration resistance of the RGA gravels caused the dual-tube sampling system to fail.) Therefore, the SWMUs 211-A and 211-B investigation (as well as the SWMU 4 investigation) used HSAs to access the planned sample depths.

In most locations, a smaller, Central Mine Equipment (CME)-55 drill rig, using 4 ¼-inch inside diameter (8 ¼-inch outside diameter) augers pre-drilled locations to 65 ft depth and later abandoned the boreholes once sampling was completed. A larger, CME-75 drill rig, using the same augers, drilled through the RGA and placed the sampling pump. A pilot assembly with center head attached to a string of AWJ drill rod (1.75-inch outside diameter/0.625-inch inside diameter) within the augers kept soils out of the internal bore of the augers.

The project drilling subcontractor employed special steps and equipment to minimize disturbance of the RGA matrix that was exposed in the bottom of the augers. Upon reaching the depth of the sample interval, the driller immediately ceased operation of the augers (did not raise the auger string, as is customary, to create an open interval of borehole and did not over rotate the augers to clear the outer auger flights). The pilot assembly with center head that was used for the investigation was vented into the string of AWJ rod to minimize suction on the RGA matrix[2] as the pilot assembly with center head was withdrawn. The driller intentionally extracted the pilot assembly with center head slowly (with hand rotation) to minimize further suction on the RGA matrix at the base of the augers.

The sampling system consisted of a bladder pump (Well Wizard T1100) with a packer (QSP Packers, LLC, PQ wireline packer) mounted above to isolate water that was accessible to the pump from water in the augers located above the packer. The packer minimized the volume of water to be purged prior to sampling. Compressed nitrogen provided the "air" supply for operation of both the pump and packer.

The investigation schedule necessitated a one-hour limit to the groundwater purge and sampling effort for most sampling intervals. At depths of 75 ft bgs and below in the RGA, samplers were able to purge one-to-two times the volume of groundwater in the augers below the packer before sampling. The purge efforts were less effective for the upper two sample intervals (65 ft bgs and 70 ft bgs) because the height of the water column above the pump was insufficient for effective pump operation. (Greater purge volumes are less important for the uppermost sample depths where less water column is available for mixing.) With one exception (the first sample borehole, 211-A-046), sampling ceased at the base of the RGA. The underlying McNairy Formation was recognized primarily by the presence of significantly lower water levels inside the auger string prior to purging and by the inability of the formation to sustain a minimal pumping rate.

The investigation crew collected most samples directly from the discharge stream of the pump. In a few cases where the entrained sediment load was greatest, the discharged groundwater was first collected in a precleaned, stainless steel cup and then poured into the sample vials. Prior to sample collection, field parameters were measured in a cup sample with a Hydrolab water quality meter. The entrained sediment load was too great to permit use of a flow cell for field parameter measurements. For the investigation, the field parameters consisted of conductivity, dissolved oxygen, temperature, pH, oxidation/reduction potential, and turbidity. The sample vial labels and chains-of-custody were completed and maintained "real time." The samples were stored in sample coolers with wet ice during the day and transferred to sample refrigerators for storage. Trip blanks were collected at the beginning of each day of the field investigation and maintained in the sample coolers and sample refrigerators, along with the groundwater samples. Samples were shipped to the laboratory on the next day, except for the following:

- Samples of 211-A-048, 70 ft to 90 ft (sampled on Friday and shipped on Monday);
- Samples of 211-A-048, 95 ft, and 211-B-021, 65 ft (sampled on Saturday and shipped on Monday); and
- Samples of 211-A-049, 70 to 90 ft (sampled and shipped on the same-day, Wednesday).

Following the sample collection effort at each sample interval, the pump and inside of the associated sample discharge tubing (Teflon) was decontaminated in a three-step process (soap water wash, followed by tap water and deionized water rinses), consistent with LATA Kentucky procedure *Decontamination of Sampling Equipment and Devices*, PAD-ENM-2702, R0. The packer and outside of the air supply and discharge tubing were rinsed with tap water and wiped down as the sampling assembly was extracted after each sampling effort. (All but the bottom of the packer and the interior of the tubing were isolated from the sample interval during the sample process.)

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[2] The importance of minimizing suction at the base of the augers is to limit the tendency of saturated sands of the RGA from flowing into the then-open augers, which would increase turbidity of the water and potentially prevent reseating of the pilot assembly in the HSAs.

# H.5. DATA EVALUATION

Data verification, validation, and assessment were performed for the project data in accordance with CP3-ES-5003, "Quality Assured Data" (Fluor Federal Services 2015). The data evaluation results are stored in Paducah Project Environmental Measurements System and have been transferred with the data to the Paducah Oak Ridge Environmental Information System database. Results are available through the Paducah version of DOE's PPPO Environmental Geographic Analytical Spatial Information System (PEGASIS) Web site at http://padgis.latakentucky.com/padgis/.

The data evaluation for the 2015 groundwater investigation of the RDSI identified the following variances. At SWMU 211-A, a total of 40 groundwater samples (excluding quality control samples) was allotted (five soil borings with eight samples each, at depths of 65 to 100 ft). The investigation sampled each of the planned borings to the base of the RGA (the project objective). Due to the field-determined depth of the base of the RGA, the deepest groundwater sample was collected from 2 of the borings at a depth of approximately 100 ft, in 2 of the borings at a depth of approximately 95 ft, and in 1 of the borings from an approximate depth of 90 ft. A total of 36 groundwater samples was collected. At SWMU 211-B, 6 groundwater samples were collected from the lone soil boring, to 90 ft depth due to the field-determined depth of the base of the RGA.

All of the investigation groundwater analyses met the laboratory reporting limits required by the RDWP (DOE 2015). Data verification assured that the data was flagged correctly. Chains-of-custody were reviewed and found to be compliant. The data assessment determined that the data were of known quality and useable.

Results for 25 analyses were qualified "J" (indicating estimated values), of which two were for duplicate samples. Of the 25 "J" results, 23 were analyses below the required laboratory reporting limit. Two of the "J" results were associated with 1,1-DCE analyses that exceed the laboratory reporting limit: Sample 211-A-048 at 70 ft depth (21 μg/L) and Sample 211-A-048 at 95 ft depth (22 μg/L) where the matrix spike recovery was below the lower control limit.

Level IV data validation for the 2015 groundwater investigation of the RDSI was performed at a rate of 27% (12 of 45 samples[3]), which exceeded the requirements of the RDSI characterization plan (10% data validation). No data were rejected during data validation. The data validation qualified only 2 of 60 results where the matrix spike recovery was below the lower control limit, as summarized above. The analyses of the validated samples were compliant with quality control requirements set forth by the analytical methods.

Except for analyses that were qualified "U" (meaning "compound analyzed for but not detected at or below the lowest concentration reported"), the laboratory and validation process applied no other result qualifiers to the investigation data.

# H.6. DATA ASSESSMENT AND VERIFICATION

Data assessment and verification were performed on 100% of the data. Data verification includes checking methods, units, reporting limits, holding times, and analytical completeness. No exceptions were

[3] The 12 samples included 1 duplicate sample, 1 field blank sample, 1 rinseate sample, and 2 trip blank samples.

identified for the project data during data verification. Data assessment considered results of data verification, laboratory data qualifiers, laboratory comments, and sampler's comments. All data were found to be of known quality, and it was determined that decisions could be made from the data based on the review.

The 2015 groundwater investigation of the RDSI achieved a high degree of completeness. All six of the planned soil borings were sampled for RGA groundwater beginning at 65 ft depth, as planned. Samples were collected in each 5-ft interval to the base of the RGA in all of the soil borings.

## H.7. UNCERTAINTY EVALUATION

Factors that may affect uncertainty in site characterization data sets include the following:

- Results and frequencies of quality control samples, quality control exceedances, and qualifiers;
- Biases and trends in the data; and
- Project completeness.

The field investigation collected two field blank samples, three equipment rinseate samples, and eight trip blank samples for analysis of quality control. All quality control samples were analyzed for TCE; 1,1-DCE; *cis*-1,2-DCE; *trans*-1,2-DCE; and vinyl chloride. All quality control analysis results were < 1 ppb, the lab reporting limit, indicating good quality control of the decontamination process and sample shipping and minimal, if any, bias from airborne VOC levels.

The investigation also collected three duplicate samples for analysis. In each case, the difference of the original sample and duplicate sample results were ≤ +/-10% of the value of the original sample analysis, indicating good repeatability of the sampling process and laboratory analysis.

As documented above, there were very few quality control exceedances and the occurrence of data qualifiers were limited primarily to estimated results below the laboratory-required reporting limit and nondetect results compliant with project requirements. These factors do not affect the utility of the data for assessing the level of the contribution of the SWMUs to RGA contaminant levels with regard to selection of the final remedy.

Sampling and analysis protocols identified in the sampling and analysis plan addendum for the 2015 groundwater investigation of the RDSI were selected to optimize the representativeness of the sample and minimize the loss of VOCs, thereby reducing the potential of uncertainty associated with underestimating the presence of VOCs. The field investigation followed the sampling and analysis plan addendum for sample technique and laboratory methods except for the following:

- The dual tube sampling system for DPT, the preferred drilling method, failed due to the significant penetration resistance of the gravels of the RGA. HSAs, identified in the sampling and analysis plan as the alternative drilling method, were used to access the sample intervals.

- The investigation schedule did not allow for the targeted purge volume (based on the flooded volume of the augers) prior to sampling, as specified in the sampling and analysis plan, due to the larger volume of the HSAs.

DPT was the preferred drilling system primarily due to the expectation that the drilling method would minimally disturb the RGA at the point of sampling. Steps were taken to minimize the disturbance of the formation due to use of the HSAs. Upon reaching the sample depth, the augers were not over-rotated, a customary technique that clears the auger flights of soil, but mixes the formation matrix at the auger head and creates pathways to mingle groundwater from different depths. A vented pilot bit for the HSAs minimized the suction created (and soil disturbance) as the center rod assembly was withdrawn to permit sampling. Moreover, the driller intentionally withdrew the pilot bit slowly, with rotation, to further minimize suction.

Purging prior to sampling was intended to minimize the impact of the drilling system on the groundwater sample quality. Groundwater purging, prior to sampling, was implemented with the HSAs. The project schedule did not permit the targeted purge volume of three times the flooded volume of the augers, but a packer was used above the pump within the augers to minimize the effective volume to be purged. The pump/packer setting was adjusted based on field experience to minimize the entrained sediment load of the purge water[4] and minimize the effective flooded volume of the augers. Purge volumes achieved ranged from one to two flooded volumes of the augers.

Significantly lower water levels were measured inside the augers when the augers penetrated into the underlying McNairy Formation, as compared to the RGA. These measurements demonstrated that the seals between augers were effective at limiting inflow of water. The demonstrated integrity of the HSA system provided additional assurance that the water column inside the HSAs was representative of the sample depth and the achieved purge volume was sufficient to provide a quality sample.

# H.8. SAMPLE RESULTS AND ASSESSMENT

Six soil boring locations, documented in Table H.1 and shown in Figure H.1, were performed, with five locations around SWMU 211-A and one location within SWMU 211-B. (Relationships are assigned with the assumption that groundwater flows northerly, consistent with the broader site trends.) The investigation collected groundwater samples in each of the soil borings at 5-ft intervals, beginning at 65 ft depth and continuing to the base of the RGA (at depths of 90 to 100 ft).

Table H.2 presents the investigation analyses for TCE as well as the related VOCs 1,1-DCE; *cis*-1,2-DCE; *trans*-1,2-DCE; and vinyl chloride.

## H.8.1 TCE ANALYSES

Table H.3 summarizes the comparisons of TCE analyses, consistent with the project decision rules. Sample depths are grouped into upper, middle, and lower RGA zones to yield the greatest downgradient difference (to minimize the chance of not recognizing a significant difference). Sample results may be included in the average of two adjacent RGA zones (upper, middle, or lower).

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[4] When the pump was set near the bottom of the auger string, entrained sediment plugged the pump screen. Setting the pump higher in the auger string provided a thicker water column for settling the sediments but increased the flooded volume to be purged.

**Table H.1. SWMUs 211-A and 211-B Sample Borings**

| Sample Boring | Relationship | Plant Coordinates | |
|---|---|---|---|
| | | East | North |
| 211-A-045<br>• East side of SWMU 211-A | Upgradient Location of SWMU 211-A | -4,890 | -2,060 |
| 211-A-046<br>• South side of SWMU 211-A | Upgradient Location of SWMU 211-A | -5,030 | -2,145 |
| 211-A-047<br>• North side of SWMU 211-A | Downgradient Location of SWMU 211-A | -5,030 | -1,955 |
| 211-A-048<br>• South side of SWMU 211-A | Upgradient Location of SWMU 211-A | -5,180 | -2,135 |
| 211-A-049<br>• North side of SWMU 211-A | Downgradient Location of SWMU 211-A | -5,260 | -1,955 |
| 211-B-021<br>• Internal Boring for SWMU 211-B | Beneath/“Downgradient” of SWMU 211-B | -5,138 | -2,600 |

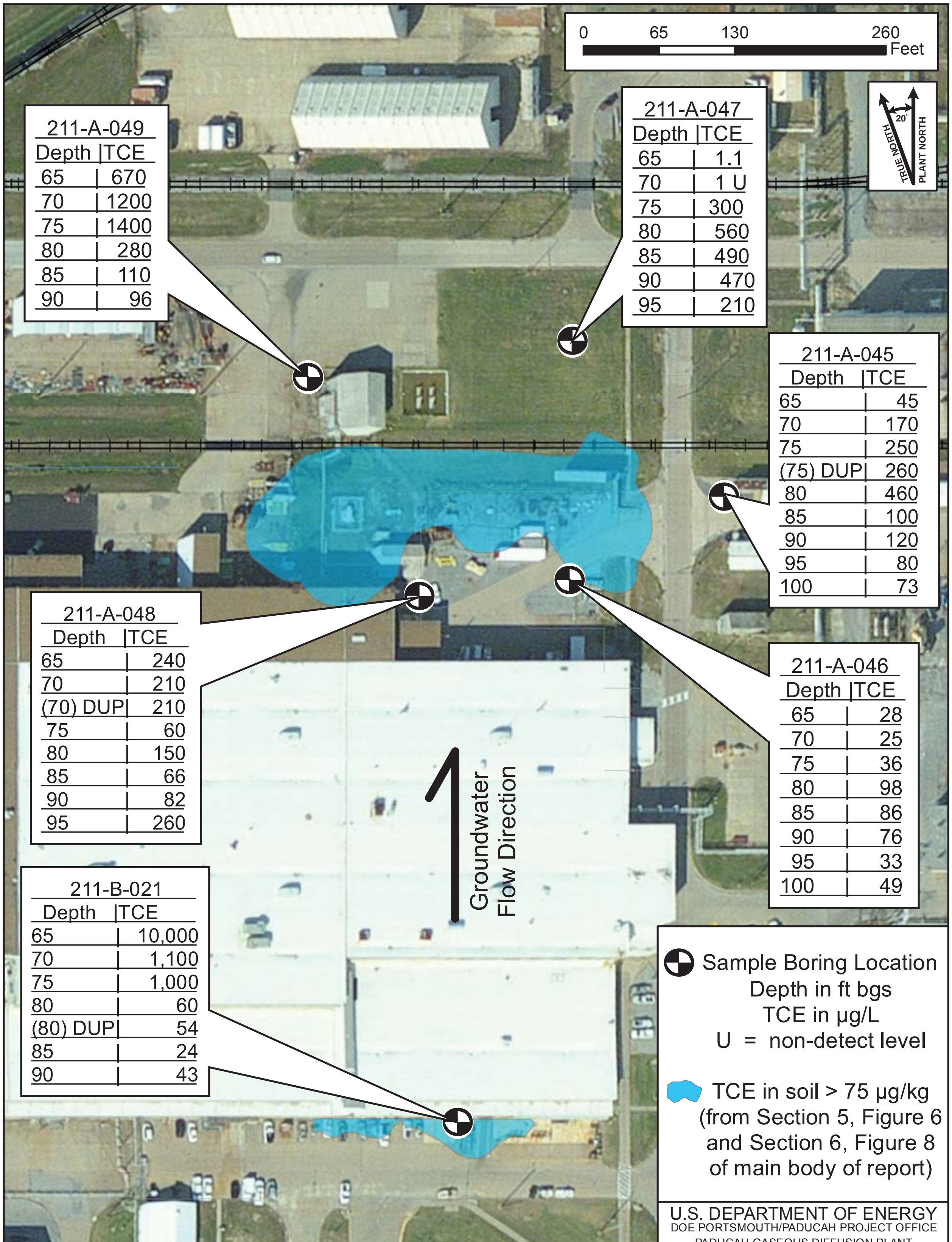


**Figure H.1. Sample Boring Locations**

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**Table H.2. Volatile Organic Compound Analyses for the 2015 Groundwater Investigation of the Remedial Design Support Investigation**

| Station | Depth Sampled (ft) | Date Collected | Trichloroethene (ug/L) Result | Trichloroethene (ug/L) Qualifier | 1,1-Dichloroethene (ug/L) Result | 1,1-Dichloroethene (ug/L) Qualifier | cis-1,2-Dichloroethene (ug/L) Result | cis-1,2-Dichloroethene (ug/L) Qualifier | *cis*-1,2-Dichloroethene/ Trichloroethene Ratio (%) | *trans*-1,2-Dichloroethene (ug/L) Result | *trans*-1,2-Dichloroethene (ug/L) Qualifier | Vinyl Chloride (ug/L) Result | Vinyl Chloride (ug/L) Qualifier |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 211-A-045 | 65 | 6/29/2015 | 45 | | 4.2 | | 2.5 | | 6 | 1 | U | 1 | U |
| 211-A-045 | 70 | 6/29/2015 | 170 | | 22 | | 7.8 | | 5 | 1 | U | 1 | U |
| 211-A-045 | 75 | 6/30/2015 | 250 | | 39 | | 13 | | 5 | 0.36 | J | 1 | U |
| 211-A-045 | (duplicate) 75 | 6/30/2015 | 260 | | 40 | | 13 | | 5 | 0.38 | J | 1 | U |
| 211-A-045 | 80 | 6/30/2015 | 460 | | 49 | | 19 | | 4 | 0.33 | J | 1 | U |
| 211-A-045 | 85 | 6/30/2015 | 100 | | 9.5 | | 32 | | 32 | 1 | U | 1 | U |
| 211-A-045 | 90 | 6/30/2015 | 120 | | 7.5 | | 26 | | 22 | 0.32 | J | 1 | U |
| 211-A-045 | 95 | 6/30/2015 | 80 | | 2.4 | | 22 | | 28 | 1 | U | 1 | U |
| 211-A-045 | 100 | 6/30/2015 | 73 | | 5.7 | | 19 | | 26 | 1 | U | 1 | U |
| 211-A-046 | 65 | 6/23/2015 | 28 | | 2.2 | | 4 | | 14 | 1 | U | 1 | U |
| 211-A-046 | 70 | 6/23/2015 | 25 | | 3.4 | | 4.4 | | 18 | 1 | U | 1 | U |
| 211-A-046 | 75 | 6/24/2015 | 36 | | 3.3 | | 10 | | 28 | 1 | U | 1 | U |
| 211-A-046 | 80 | 6/24/2015 | 98 | | 11 | | 51 | | 52 | 1 | U | 1 | U |
| 211-A-046 | 85 | 6/24/2015 | 86 | | 5.6 | | 32 | | 37 | 1 | U | 1 | U |
| 211-A-046 | 90 | 6/24/2015 | 76 | | 2.3 | | 19 | | 25 | 1 | U | 1 | U |
| 211-A-046 | 95 | 6/24/2015 | 33 | | 1.5 | | 7.6 | | 23 | 1 | U | 1 | U |
| 211-A-046 | 100 | 6/24/2015 | 49 | | 2.6 | | 14 | | 29 | 1 | U | 1 | U |
| 211-A-047 | 65 | 6/24/2015 | 1.1 | | 1 | U | 1 | U | 91 | 1 | U | 1 | U |
| 211-A-047 | 70 | 6/25/2015 | 1 | U | 1 | U | 1 | U | 100 | 1 | U | 1 | U |
| 211-A-047 | 75 | 6/25/2015 | 300 | | 58 | | 29 | | 10 | 0.54 | J | 1 | U |
| 211-A-047 | 80 | 6/25/2015 | 560 | | 72 | | 32 | | 6 | 0.89 | J | 1 | U |
| 211-A-047 | 85 | 6/25/2015 | 490 | | 71 | | 34 | | 7 | 1.2 | | 1 | U |
| 211-A-047 | 90 | 6/25/2015 | 470 | | 62 | | 31 | | 7 | 1.1 | | 1 | U |
| 211-A-047 | 95 | 6/25/2015 | 210 | | 26 | | 49 | | 23 | 1.3 | | 1 | U |
| 211-A-048 | 65 | 6/25/2015 | 240 | | 29 | | 740 | | 308 | 0.8 | J | 79 | |
| 211-A-048 | 70 | 6/26/2015 | 210 | | 21 | J | 610 | | 290 | 0.78 | J | 57 | |
| 211-A-048 | (duplicate) 70 | 6/26/2015 | 210 | | 20 | | 640 | | 305 | 0.69 | J | 60 | |
| 211-A-048 | 75 | 6/26/2015 | 60 | | 15 | | 49 | | 82 | 0.34 | J | 3.5 | |
| 211-A-048 | 80 | 6/26/2015 | 150 | | 56 | | 81 | | 54 | 0.62 | J | 1.6 | |
| 211-A-048 | 85 | 6/26/2015 | 66 | | 21 | | 45 | | 68 | 0.36 | J | 1.4 | |
| 211-A-048 | 90 | 6/26/2015 | 82 | | 15 | | 45 | | 55 | 0.45 | J | 0.65 | J |
| 211-A-048 | 95 | 6/27/2015 | 260 | | 22 | J | 49 | | 19 | 0.41 | J | 0.96 | J |
| 211-A-049 | 65 | 6/30/2015 | 670 | | 1,400 | | 56 | | 8 | 1 | U | 1.9 | |
| 211-A-049 | 70 | 7/1/2015 | 1,200 | | 2,100 | | 79 | | 7 | 0.47 | J | 3 | |
| 211-A-049 | 75 | 7/1/2015 | 1,400 | | 2,200 | | 77 | | 6 | 0.54 | J | 3.2 | |
| 211-A-049 | 80 | 7/1/2015 | 280 | | 360 | | 44 | | 16 | 0.49 | J | 0.76 | J |
| 211-A-049 | 85 | 7/1/2015 | 110 | | 59 | | 42 | | 38 | 0.39 | J | 1 | U |
| 211-A-049 | 90 | 7/1/2015 | 96 | | 50 | | 36 | | 38 | 1 | U | 1 | U |
| 211-B-021 | 65 | 6/27/2015 | 10,000 | | 1.1 | | 210 | | 2 | 0.6 | J | 1 | U |
| 211-B-021 | 70 | 6/29/2015 | 1,100 | | 0.31 | J | 26 | | 2 | 1 | U | 1 | U |
| 211-B-021 | 75 | 6/29/2015 | 1,000 | | 1 | U | 28 | | 3 | 1 | U | 1 | U |
| 211-B-021 | 80 | 6/29/2015 | 60 | | 1 | U | 2.4 | | 4 | 1 | U | 1 | U |
| 211-B-021 | (duplicate) 80 | 6/29/2015 | 54 | | 1 | U | 2.2 | | 4 | 1 | U | 1 | U |
| 211-B-021 | 85 | 6/29/2015 | 24 | | 1 | U | 1.6 | | 7 | 1 | U | 1 | U |
| 211-B-021 | 90 | 6/29/2015 | 43 | | 1 | U | 1.5 | | 3 | 1 | U | 1 | U |

Table H.2. Volatile Organic Compound Analyses for the 2015 Groundwater Investigation of the Remedial Design Support Investigation (Continued)

| Date Collected | Station(s) | Quality Control Sample Type | Trichloroethene (ug/L) | | 1,1-Dichloroethene (ug/L) | | cis-1,2-Dichloroethene (ug/L) | | *trans*-1,2-Dichloroethene (ug/L) | | Vinyl Chloride (ug/L) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| 6/23/15 | 211-A-046 | Rinseate | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| | | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 6/24/15 | 211-A-046<br>211-A-047 | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 6/25/15 | 211-A-047<br>211-A-048 | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 6/26/2015 | 211-A-048 | Field Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| | | Rinseate | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| | | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 6/27/2015 | 211-A-048<br>211-B-021 | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 6/29/2015 | 211-A-045<br>211-B-021 | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 6/30/15 | 211-A-045<br>211-A-049 | Field Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| | | Rinseate | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| | | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 7/1/15 | 211-A-049 | Trip Blank | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |

**Table H.3. Assessment of SWMU 211-A and 211-B Sample Results**

| RGA Zone (depth in feet) | Downgradient TCE Average[a] (ppb) | Upgradient TCE Average[a] (ppb) | Difference of Averages (ppb) | Decision Rules | |
|---|---|---|---|---|---|
| | | | | Difference of Averages < Approximately 400 ppb | 11,000 ppb > Difference of Averages > 400 ppb |
| **East SWMU 211-A** | 211-A-047 | 211-A-045 | | | |
| Upper (65–75) | 101 | 155 | -54 | X | -- |
| Middle (75–90) | 455 | 233 | 223 | X | -- |
| Lower (90–95) | 340 | 100 | 240 | X | -- |
| | 211-A-047 | 211-A-046 | | | |
| Upper (65–75) | 101 | 30 | 71 | X | -- |
| Middle (75–90) | 455 | 74 | 381 | X | -- |
| Lower (90–95) | 340 | 55 | 286 | X | -- |
| **West SWMU 211-A** | 211-A-049 | 211-A-048 | | | |
| Upper (65–70) | 935 | 225 | 710 | -- | X |
| Middle (75–80) | 840 | 105 | 735 | -- | X |
| Lower (85–90) | 103 | 74 | 29 | X | -- |
| **SWMU 211-B** | 211-B-021 | | | | |
| Upper (65) | 10,000 | NA[b] | -- | -- | ~ X[c] |
| Middle (70-75) | 1,050 | NA | -- | -- | X |
| Lower (80-90) | 42 | NA | -- | X | -- |

[a] Duplicate results were not used in calculating average concentrations.
[b] An upgradient sample boring was not sampled for SWMU 211-B.
[c] The sum of the analysis result and error range is 11,100 ppb.

In the east SWMU 211-A area, the difference of average upgradient and downgradient TCE levels is less than the lower criterion of approximately 400 ppb used in the decision rules. In the west SWMU 211-A area, the difference falls between the approximately 400 ppb and 11,000 ppb criteria for remedial decisions at SWMUs 211-A and 211-B. The different results of the east and west areas of SWMU 211-A provide a basis for focusing remedial action components of the selected remedy for SWMU 211-A.

At SWMU 211-B, the analyses for three upper RGA samples from depths of 65 ft, 70 ft, and 75 ft depth substantially exceed the 400 ppb action level. Moreover, the analysis for the sample at 65 ft depth—10,000 ppb with a control limit range (error range) of 1,100 ppb—approximates the project criterion for recognizing the presence of DNAPL (11,000 ppb).

The objective of the 2015 groundwater investigation of the RDSI was to assess the contribution of the SWMUs to levels of TCE and related VOCs in RGA groundwater. The field investigation used a biased sampling approach, characterizing groundwater quality in upgradient and downgradient areas at SWMU 211-A and sampling directly beneath SWMU 211-B, where upgradient levels of TCE and related VOCs are anticipated to be low and where sampling is inaccessible in the near-downgradient area due to the proximity of the C-720 Building. Separate decision rules exist for SWMUs 211-A and 211-B, but the data set was intended to be evaluated holistically. The data support a straightforward analysis of SWMU 211-A. The CSM for SWMU 211-A is validated. TCE analyses for SWMU 211-B unequivocally indicate a significant impact at the SWMU: DNAPL may be present in either the UCRS or the RGA, and the CSM may be invalid.

### H.8.2 OTHER VOLATILE ORGANIC COMPOUND ANALYSES

The decision rules do not address the analyses for 1,1-DCE; *cis*-1,2-DCE; *trans*-1,2-DCE; and vinyl chloride. However, an assessment of this data provides useful context for understanding the groundwater flow system at the C-720 Building and the area of SWMUs 211-A and 211-B.

The relationships of TCE and *cis*-1,2-DCE in sample borings 211-A-046 and 211-A-047 are consistent with expectations for background and upgradient/downgradient associations. (Levels of *trans*-1,2-DCE and vinyl chloride are less than 2 ppb).

- Upgradient sample boring 211-A-046 has a uniformly low level of TCE (< 100 ppb) with *cis*-1,2-DCE/TCE ratios > 10%, indicative of a longer contaminant residence time in the RGA.
- The upper portion of downgradient boring 211-A-047 (samples for 65 ft and 70 ft depths) is uniquely devoid of VOCs (1.1 ppb or less combined VOCs), suggestive of vertical flow to 70 ft depth with no contribution of contamination from the UCRS.
- Between 75 ft and 90 ft in sample boring 211-A-047, TCE levels spike to 300 ppb or greater with *cis*-1,2-DCE/TCE ratios ≤ 10%, indicative of a close upgradient source and lesser contaminant residence time.

A similar "downgradient to contamination" pattern is apparent in 211-A-045, with lowest TCE values in the 65 ft sample but highest TCE values in the 70 ft to 80 ft samples (170 to 460 ppb) and with *cis*-1,2-DCE/TCE ratios of 6% or less (65 to 80 ft). If the source of the shallow contamination in 211-A-045 is SWMU 211-A, then local groundwater flow has a strong easterly component.

Groundwater at 211-A-048, the upgradient sample boring for the west side of SWMU 211-A, has an upgradient contaminant source.

- Soils analyses from the SWMUs 211-A and 211-B RDSI of 2012 and 2013 document very low levels of VOC contamination in the area UCRS soils.
- Groundwater analyses from the 2015 phase of the RDSI have highest TCE levels (210 ppb to 240 ppb[5]) and *cis*-1,2-DCE levels (610 ppb to 740 ppb) in the samples from 65 ft and 70 ft depths. Ratios of *cis*-1,2-DCE/TCE range from 290% to 308% in the samples from 65 ft and 70 ft depths.

This ratio suggests the occurrence of active anaerobic degradation of TCE, as does relatively high levels of vinyl chloride (57–79 ppb) from 65 and 70 ft depths.[6] Anaerobic conditions may be supported by locally reduced UCRS recharge due to the area's paved surface and the sample boring's location immediately to the north (downgradient) of the C-720 Building.

Both TCE and 1,1-DCE trends in sample boring 211-A-049 are suggestive of a "downgradient to contamination" relationship.

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[5] Excluding the bottom RGA sample (95 ft) TCE result of 260 ppb.

[6] Field measurements for the groundwater samples from 211-A-048 document high dissolved oxygen levels (1.97 to 11.72 ppm), which are incompatible with anaerobic conditions. High entrained sediment content prevented use of a flow cell for field measurements: the measurements were made in a cup sample. Dissolved oxygen levels appear to have been biased high during field measurements.

- The highest TCE and 1,1-DCE contaminant levels were found in the samples at 70 and 75 ft deep (1,200 ppb and 1,400 ppb TCE and 2,100 and 2,200 ppb 1,1-DCE).

- Lesser contaminant levels at the 65 ft depth (670 ppb TCE and 1,400 ppb 1,1-DCE) reflect the influence of UCRS recharge.

- Ratios of *cis*-1,2-DCE/TCE are 8% or less between 65 and 75 ft deep, consistent with minimal contaminant residence time in the RGA and the presence of a nearby source zone.

The lesser *cis*-1,2-DCE levels in 211-A-049 (highest level of 79 ppb) compared to 211-A-048 (highest level of 740 ppb) indicate 211-A-049 is not directly downgradient of 211-A-048. Sample borings 211-A-048 and 211-A-049 are downgradient to different sources; however, the upgradient/downgradient comparison of TCE levels of the decision rules would not differ significantly with lower upgradient TCE levels. The occurrence of elevated levels of 1,1-DCE in groundwater samples from 211-A-049 is consistent with the west side of the SWMU 211-A source zone, as defined in the RDSI of 2012 and 2013. UCRS soils of the west side contained appreciable levels of both TCE and 1,1-DCE.

Dissolved RGA contaminant trends at SWMU 211-B, notably TCE and *cis*-1,2-DCE, are consistent with a UCRS contaminant source in the area of 211-B-021. TCE and *cis*-1,2-DCE levels are highest in the 65 ft depth sample (10,000 ppb TCE and 210 ppb *cis*-1,2-DCE) and drop to approximately 10% of the concentrations in the samples at 70 ft and 75 ft, showing the influence of mixing of vertical flow from the UCRS with the lateral flow that predominates in the RGA.

# H.9. CONCLUSIONS

The 2015 phase of the SWMUs 211-A and 211-B investigation sampled groundwater from the RGA in 5-ft intervals from a depth of 65 ft to the base of the RGA in all six proposed locations. A holistic review of the data, as summarized above, indicates that the investigation data are appropriate for assessing the impact of SWMUs 211-A and 211-B to dissolved TCE levels in the RGA.

The SWMU 211-B sample results are consistent with a UCRS source zone impacting the RGA. The shallowest groundwater result for TCE (65 ft depth) approximates the established project criterion for the recognition of the presence of DNAPL, which would be inconsistent with the CSM basis of the ROD (DOE 2012). The available remedies of the ROD did not consider the possibility of the presence of DNAPL at or near SWMU 211-B. According to the decision rules for SWMU 211-B, the FFA parties must confer to evaluate the impact of the potential for DNAPL. Future decommissioning of the C-720 Building may allow opportunity to sample adjacent soils beneath the building (and currently inaccessible) and reduce the uncertainty with regard to the extent of TCE contamination at SWMU 211-B, including the presence of DNAPL.

The sample results of SWMU 211-A are consistent with the CSM. SWMU 211-A is contributing TCE levels in excess of 400 ppb, but less than 11,000 ppb on the west side only. The SWMU 211-A decision rules direct implementation of enhanced bioremediation with interim LUCs and long-term monitoring (Alternative 8). These results support focused application of enhanced bioremediation on the west side.

Results of the 2015 phase of the investigation indicate DNAPL may be present at SWMU 211-B and the CSM may be invalid. SWMU 211-B is upgradient of SWMU 211-A. The project decision rules do not consider the implications of the invalidation of the CSM at SWMU 211-B upon the remedial actions at SWMU 211-A. 211-A-048, the upgradient sample boring for the west side of SWMU 211-A, appears to be impacted by an upgradient contaminant source. That contaminant source may be SWMU 211-B or another source underlying the C-720 Building. Further discussions are warranted among the FFA parties with regard to the TCE source located upgradient of SWMU 211-A, the possibility that anaerobic degradation is affecting this source, and on the timing of the SWMU 211-A remedial action.

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# ATTACHMENT

# FIELD MEASUREMENTS AND BAROMETRIC PRESSURE

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## Field Measurements and Barometric Pressure

| Station | Date Collected | Depth Sampled (ft) | Height of Top of Auger (approx. inches) | Open Hole Depth (ft) | Purge Volume (gal/% flooded volume[7]) | Starting Depth to Water (ft) | Barometric Pressure (inch/Hg) |
|---|---|---|---|---|---|---|---|
| 211-A-045 | 6/29/2015 | 65 | 12 | 65.3 | 7.25 gal/ 60% | 33.05 | 29.92 |
| | | 70 | 14 | 70.6 | 12.25 gal/ 80% | 43.37 | |
| | 6/30/2015 | 75 | 14 | 74.5 | 22.25 gal/150% | 47.29 | 29.96 |
| | | 80 | 14 | 79.8 | 23.75 gal/160% | 47.02 | 29.92 |
| | | 85 | 14 | 84.1 | 20.75 gal/140% | 47.75 | |
| | | 90 | 20 | 89.7 | 18.25 gal/120% | 47.27 | |
| | | 95 | 14 | 94.5 | 15.0 gal/100% | 47.66 | 29.94 |
| | | 100 | 15 | 99.3 | 20.25 gal/130% | 47.80 | 29.96 |
| 211-A-046 | 6/23/2015 | 65 | 12 | 65.6 | 6.0 gal/ 80% | 46.37 | 29.96 |
| | | 70 | 12 | 70.0 | 20.0 gal/130% | 45.13 | |
| | 6/24/2015 | 75 | 12 | 74.7 | 20.0 gal/130% | 46.75 | 29.89 |
| | | 80 | 12 | 79.5 | 20.0 gal/130% | 49.47 | 29.86 |
| | | 85 | 12 | 84.3 | 20.0 gal/130% | 47.39 | 29.87 |
| | | 90 | 12 | 89.3 | 25.0 gal/170% | 47.60 | |
| | | 95 | 12 | 94.3 | 22.0 gal/150% | 47.74 | 29.90 |
| | | 100 | 12 | 100.0 | 2.75 gal/ 20% | 61.35 | 29.91 |
| 211-A-047 | 6/24/2015 | 65 | 12 | 65.1 | 2.0 gal/ 10% | 45.50 | 29.91 |
| | 6/25/2015 | 70 | 12 | 69.0 | 10.0 gal/ 70% | 44.69 | 29.87 |
| | | 75 | 12 | 74.8 | 20.0 gal/130% | 46.28 | |
| | | 80 | 12 | 80.0 | 22.0 gal/150% | 48.12 | |
| | | 85 | 12 | 84.8 | 32.0 gal/210% | 47.87 | |
| | | 90 | 12 | 90.0 | 21.0 gal/140% | 47.51 | 29.90 |
| | | 95 | 12 | 94.4 | 21.5 gal/140% | 48.20 | 29.96 |
| 211-A-048 | 6/25/2015 | 65 | 12 | 64.8 | 9.5 gal/ 60% | 38.63 | 29.91 |
| | 6/26/2015 | 70 | 10 | 70.5 | 9.5 gal/ 60% | 43.70 | 29.87 |
| | | 75 | 14 | 75.0 | 20.5 gal/140% | 49.31 | |
| | | 80 | 12 | 79.0 | 23.75 gal/160% | 48.10 | |
| | | 85 | 12 | 84.2 | 23.0 gal/150% | 47.68 | 29.90 |
| | | 90 | 12 | 89.5 | 24.0 gal/160% | 48.12 | |
| | 6/27/2015 | 95 | 14 | 95.1 | 21.5 gal/140% | 49.18 | 29.91 |
| 211-A-049 | 6/30/2015 | 65 | 14 | 64.6 | 15.5 gal/200% | 48.78 | 29.96 |
| | 7/1/2015 | 70 | 24 | 70.0 | 21.5 gal/190% | 47.15 | 30.00 |
| | | 75 | 24 | 74.8 | 22.75 gal/200% | 46.91 | |
| | | 80 | 24 | 79.0 | 21.25 gal/190% | 46.84 | |
| | | 85 | 24 | 84.3 | 17.75 gal/160% | 48.75 | |
| | | 90 | 24 | 89.0 | 21.0 gal/140% | 48.46 | |
| 211-B-021 | 6/27/2015 | 65 | 12 | 65.5 | 16.5 gal/210% | 27.07 | 29.96 |
| | 6/29/2015 | 70 | 10 | 68.6 | 13.25 gal/120% | 43.48 | 29.91 |
| | | 75 | 14 | 75.4 | 20.5 gal/140% | 48.97 | |
| | | 80 | 14 | 78.0 | 25.0 gal/170% | 45.03 | 29.97 |
| | | 85 | 12 | 84.5 | 24.0 gal/160% | 46.58 | 29.92 |
| | | 90 | 16 | 89.5 | 17.0 gal/110% | 46.91 | |

[7] Flooded volume refers to the volume of the HSAs below the packer.

## Field Measurements and Barometric Pressure

| Station | Depth Sampled (ft) | Conductivity (µmho/cm) | Dissolved Oxygen (mg/L) | Oxidation-Reduction Potential (mV) | pH (Std Units) | Temp (deg F) | Turbidity* (NTU) |
|---|---|---|---|---|---|---|---|
| 211-A-045 | 65 | 1370 | 4.16 | 291 | 7.84 | 77.0 | 5999 |
| | 70 | 1258 | 6.04 | 163 | 6.71 | 75.8 | 5999 |
| | 75 | 1023 | 5.87 | 529 | 7.52 | 67.9 | 2000 |
| | 80 | 735 | 8.05 | 112 | 7.46 | 68.9 | 2000 |
| | 85 | 527 | 6.11 | 204 | 7.38 | 71.2 | 5999 |
| | 90 | 434 | 2.63 | 156 | 7.94 | 72.5 | 5999 |
| | 95 | 454 | 2.61 | 173 | 6.56 | 73.4 | 5999 |
| | 100 | 425 | 7.37 | 89 | 7.39 | 72.2 | 5999 |
| 211-A-046 | 65 | 875 | 1.80 | 250 | 6.26 | 86.1 | 5999 |
| | 70 | 947 | 2.37 | 155 | 6.96 | 75.4 | 5999 |
| | 75 | 834 | 2.95 | -168 | 6.67 | 70.5 | 5999 |
| | 80 | 555 | 3.04 | 175 | 6.22 | 72.7 | 2000 |
| | 85 | 514 | 2.90 | 186 | 6.36 | 75.4 | 2000 |
| | 90 | 507 | 3.32 | 160 | 6.92 | 78.6 | 1734 |
| | 95 | 338 | 3.59 | 166 | 6.93 | 79.6 | 5999 |
| | 100 | 546 | 7.18 | 100 | 7.17 | 78.7 | 2000 |
| 211-A-047 | 65 | 234 | 4.43 | 339 | 6.82 | 83.7 | 5999 |
| | 70 | 1139 | 3.64 | 154 | 6.25 | 69.3 | 1118 |
| | 75 | 657 | 3.67 | 110 | 6.58 | 71.1 | 5999 |
| | 80 | 630 | 7.84 | 142 | 7.26 | 69.8 | 5999 |
| | 85 | 633 | 3.41 | 328 | 6.51 | 73.4 | 2000 |
| | 90 | 657 | 3.75 | 334 | 6.96 | 74.7 | 5999 |
| | 95 | 613 | 6.85 | 317 | 7.05 | 74.5 | 5999 |
| 211-A-048 | 65 | 422 | 6.49 | 92 | 7.95 | 74.9 | 5999 |
| | 70 | 477 | 1.97 | 122 | 6.99 | 77.0 | 615 |
| | 75 | 671 | 11.72 | 253 | 6.52 | 72.0 | 5999 |
| | 80 | 646 | 7.35 | 241 | 6.26 | 72.7 | 2456 |
| | 85 | 477 | 4.60 | 101 | 7.71 | 76.9 | 5999 |
| | 90 | 456 | 2.22 | 131 | 7.12 | 79.9 | 2000 |
| | 95 | 671 | 6.34 | 161 | 6.56 | 64.3 | 5999 |
| 211-A-049 | 65 | 336 | 4.52 | 129 | 7.31 | 71.2 | 2000 |
| | 70 | 491 | 5.50 | 199 | 6.69 | 68.6 | 1312 |
| | 75 | 506 | 3.68 | 235 | 5.83 | 68.6 | 1010 |
| | 80 | 440 | 5.97 | 233 | 5.96 | 68.2 | 5999 |
| | 85 | 450 | 2.53 | 139 | 7.84 | 68.8 | 2000 |
| | 90 | 441 | 4.06 | 125 | 8.51 | 70.0 | 5999 |
| 211-B-021 | 65 | 1407 | 2.48 | 49 | 7.64 | 85.6 | 5999 |
| | 70 | 422 | 2.49 | -103 | 6.39 | 69.8 | 5999 |
| | 75 | 337 | 4.75 | 33 | 6.45 | 71.4 | 5999 |
| | 80 | 310 | 5.83 | 37 | 7.25 | 74.7 | 2000 |
| | 85 | 236 | 5.71 | 36 | 8.04 | 74.9 | 2000 |
| | 90 | 373 | 1.78 | 93 | 7.18 | 81.5 | 200 |

*The value of 5999 is the upper limit of the range of the instrument.