Groundwater Monitoring Report

April 2013 Additional Groundwater Sampling Event

West Lake Landfill Operable Unit-1

Prepared for

The United States Environmental Protection Agency Region VII

Prepared on behalf of

The West Lake Landfill OU-1 Respondents

Prepared by

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July 8, 2013

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July 8, 2013

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SUBJECT: Groundwater Monitoring Report
April 2013 Additional Groundwater Sampling Event
West Lake Landfill Operable Unit 1, Bridgeton, Missouri

Dear Mr. Gravatt,

On behalf of Cotter Corporation (N.S.L.), Laidlaw Waste Systems (Bridgeton), Inc., Rock Road Industries, Inc., and the United Sates Department of Energy (the "Respondents"), enclosed please find two copies of the Groundwater Monitoring Report for the April 2013 Additional Groundwater Sampling Event. We have also transmitted one copy of the report to the Shawn Muenks of the Missouri Department of Natural Resources. If you have any questions or need additional copies, please do not hesitate to contact me.

Sincerely,
ENGINEERING MANAGEMENT SUPPORT, Inc.

Paul V. Rosasco, P.E.

Enclosure

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1. INTRODUCTION

In January 2013 the U.S. Environmental Protection Agency, Region VII (EPA) directed the West Lake Landfill Operable Unit-1 (OU-1) Respondents to perform additional groundwater sampling at the West Lake Landfill Superfund Site. Discussions with EPA resulted in a decision to perform three additional rounds of groundwater sampling in April, July and October 2013. Engineering Management Support Inc. (EMSI), on behalf of Cotter Corporation (N.S.L.), Bridgeton Landfill, LLC and Rock Road Industries, Inc., and with funding provided by the United States Department of Energy (collectively, the OU-1 Respondents), prepared this report presenting the results of the April 2013 groundwater sampling.

EPA requested that, similar to the previous (July/August 2012) additional groundwater monitoring event, all available groundwater monitoring wells at the West Lake Landfill Superfund Site be included in the April 2013 groundwater sampling event. This includes those wells still in existence from the group of 30 wells that had previously been sampled as part of the OU-1 RI/FS, the group of 24 wells that had previously been sampled as part of the OU-2 RI investigation which, prior to the July/August 2012 event, had not been sampled since 1997 and never for Radium-228; and additional wells associated with the former Permitted Landfill which, prior to the July/August 2012 sampling event, had never been sampled for radioisotopes. As a reminder, OU-1 consists of Radiological Areas 1 and 2 which contain radiologically-impacted materials (RIM), and OU-2 consists of the remainder of the Site which did not receive RIM, including the Inactive Sanitary Landfill, the Closed Demolition Landfill, and the former Permitted Landfill's North and South Quarry units. EPA further directed that the samples obtained from these wells be analyzed for uranium, thorium, and radium radioisotopes (including Radium-226 and Radium-228), with all radioisotopes analyzed for both total (unfiltered samples) and dissolved (filtered samples) phases; plus total and dissolved phase trace metals; and volatile organic compounds (VOCs). EPA determined that analyses of the samples for semi-volatile organic compounds (SVOCs), which was performed as part of the July/August 2012 monitoring event, did not need to be included as part of the additional 2013 groundwater monitoring events.

This report presents the results of the April 2013 additional groundwater monitoring activities. Specifically, this report includes a description of the field and sample collection activities and summaries of the results of the laboratory analyses of the groundwater samples. This report also contains copies of the various field data sheets (Appendix A), the analytical laboratory reports (Appendix B), and the data validation reports and resultant database (Appendix C). Due to the size of these documents, the appendices are contained on the included compact disk.

2. FIELD AND SAMPLE COLLECTION ACTIVITIES

A Sampling and Analysis Plan (SAP) and associated planning documents were prepared to describe the proposed monitoring locations, sample collection procedures, analyte list, laboratory

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analyses, quality assurance/quality control samples and procedures, investigative-derived waste management, health and safety procedures, and data evaluation and management procedures for the July/August 2012 additional groundwater monitoring event (EMSI, 2012). EPA approved the SAP by letter dated July 3, 2012. This SAP and the associated planning documents were also used for the April 2013 event.

The groundwater sampling event began on April 2, 2013 with well inspections and collection of a complete set of water level measurements from 77 monitoring wells. A water level was not obtained from well D-14; however, a water quality sample was obtained from this well. Table 1 presents a summary of the groundwater level measurement data obtained from all of the wells. A base map showing the locations of the monitoring wells and various Site features is presented on Figure 1. Copies of the groundwater elevation measurement and the groundwater monitoring well condition report forms are contained in Appendix A.

Collection of groundwater samples began on April 3, 2013, and continued on a daily basis five days a week until sampling activities were completed on April 16, 2013. Groundwater samples were collected by Herst & Associates personnel in accordance with the procedures set forth in the SAP. Copies of the Field Information Logs from the groundwater sampling activities are contained in Appendix A. Copies of the chain of custody forms are included in the laboratory analytical reports which are contained in Appendix B.

Groundwater samples were obtained from 75 monitoring wells or piezometers at the Site (Table 2), and with two exceptions included the same monitoring wells that were sampled during the July/August 2012 monitoring event. One well (PZ-302-AS) located on the southwest side of the Inactive Sanitary Landfill did not contain sufficient water for collection of a sample (note: this same condition existed during the July/August 2012 sampling event and therefore this well was also not sampled during that event). One well (MW-102) located in the Buffer Zone along the west side of Area 2 (Figure 1) dewatered during well purging activities and the water level in this well did not recover sufficiently to allow collection of a groundwater sample during the April 2013 event. Finally, during the April 2013 event a sample was obtained from monitoring well S-53, which is located to the south of the Inactive Sanitary Landfill and west of the South Quarry Landfill (Figure 1). A sample was not previously obtained from S-53 because this well dewatered during well purging and did not recover sufficiently during the July/August 2012 event. Eight field duplicate groundwater samples were also obtained during the course of the April 2013 groundwater sampling activities (Table 2).

EPA was present for sampling activities conducted on April 9 – 11, 2013. During this period EPA obtained split samples from twelve wells (Table 2). The OU-1 Respondents do not have the analytical results from EPA's split samples.

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3. LABORATORY ANALYSES

Samples for radionuclide analyses were shipped by courier to Eberline Services Oak Ridge, TN laboratory (Eberline). The sampling crews delivered samples directly to the Test America St. Louis laboratory (Test America) for chemical analyses.

Eberline analyzed the samples for Radium-226 using EPA Modified Method 903.0; for Radium-228 using EPA Modified Method 904.0; for Thorium-228, -230 and -232 using EML Modified Method Th-01; and for Uranium-234, -235, and 238 using EML Modified Method U-02. The Eberline Analytical Reports are contained in Appendix B. The Eberline analytical laboratory reports include the laboratory results, the counting error, the combined standard uncertainty (CSU) (included on the Electronic Data Deliverable [EDD] provided by the laboratory), the minimum detectable activity (MDA) levels, and associated laboratory documentation related to sample receipt, handling, preparation and analysis.

EPA (along with other agencies) has developed the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual to address the need for a nationally consistent approach to producing radioanalytical laboratory data (EPA, 2004). MARLAP states that an important aspect of sampling and measurement is uncertainty. The Combined Standard Uncertainty (CSU) can be viewed as the statistical standard deviation of an individual radiological result (McCurdy et al., 2008). The concentration of a radiological constituent in a sample is typically calculated using a mathematical equation that includes such parameters as the measured signal response of a radiation detector (events per time unit), the detector background signal response, the detector efficiency for the radiation emission producing the response, sample aliquant size processed, chemical yield of the radiochemical process, and decay and ingrowth factors based on the half-life of the radionuclide or its decay product. Each measurement parameter in the equation has its own uncertainty defined as a standard uncertainty. The CSU of the final result is determined using the common statistical approach that the variance (squared CSU) of a function of several variables can be approximated by applying the function to the variance of each variable component (for example, MARLAP, Chapter 19 [EPA, 2004]). Using this logic, the CSU of a radiological result is the square root of a sum of variances. When a concentration and its associated CSU are reported, a confidence interval can be calculated that defines the range of concentration (the lower and upper concentration) for the "true concentration" with a certain confidence. For this project, Eberline calculated and reported the CSU at the 95%-percent or 2-sigma confidence level (analogous to the standard confidence level used when reporting the standard deviation for other water-quality results). The confidence level that is used when interpreting or publishing radiological results is dependent on the Data Quality Objectives (DQOs) of the project. Reporting the concentration with its corresponding CSU (as provided in the data) provides the 95-percent confidence interval. Therefore, the summary tables of the radionuclide analyses (see Section 6) include the laboratory calculated CSU associated with each sample result.

Test America analyzed the samples for VOCs by gas chromatography/mass spectrometry (GC/MS) using EPA Method 8260C; for the Target Analyte List (TAL) trace metals by Inductively Coupled Plasma (ICP) using EPA Method 6010C; and for Mercury by Cold Vapor

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Atomic Adsorption (CVAA) using EPA Method 7470A. The Test America Analytical Reports are included in Appendix B.

In addition to the analyses requested by EPA, the samples were analyzed for chemistry characterizations: major anions by Ion Chromatography (IC) using SW-846 Method 300.0; major cations by ICP using EPA Method 6010C; alkalinity by SW-846 Method 310.1; and bromide and iodide by IC using SW-846 Method 300.0. Results of these analyses can also be found in the Test America Analytical Reports included in Appendix B.

4. DATA VALIDATION

A Level III validation was performed consisting of manually examining data deliverables to determine data quality. All data were validated using method applicable guidelines and in accordance with the requirements of the National Functional Guidelines for Organic and Inorganic Data Review (EPA, 2008 and 2010) and by EPA SW-846 guidelines (EPA, 2007) specific to the method. Radionuclides were validated according to the guidelines and criteria specified in the MARLAP Manual (EPA, 2004). Data validation included application of data qualifiers to the analytical results based on adherence to method protocols and project-specific QA/QC limits. The data validation reports for each sample delivery group are included in Appendix C.

Method protocols reviewed included:

- Analytical holding times,
- Method blanks (MB),
- Trip blanks (TB),
- Equipments blanks (EBs),
- Matrix spikes/matrix spike duplicates (MS/MSDs),
- Laboratory control samples (LCSs),
- Shipping cooler temperatures,
- Calibrations,
- Laboratory duplicates,
- Internal Standards (ISs),
- Surrogates, and
- Chemical recovery (radionuclides).

Based on the data validation, the appropriate data qualifiers, if any, were added to the analytical results. An analytical database that includes the applied data qualifiers is included in Appendix C.

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Data quality assessment (DQA) criteria were used to evaluate the quality of the field sampling efforts and laboratory results for compliance with project DQOs. The DQA criteria are expressed in terms of analytical precision, accuracy, representativeness, completeness, and comparability (PARCC).

Precision is the measure of variability between individual sample measurements under prescribed conditions. The relative percent difference (RPD) for the field duplicate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory duplicate analyses demonstrate the precision of the analytical methods. An RPD within the method-specific control limit indicates satisfactory precision in a measurement system. For this sampling event, duplicate results were predominantly in control.

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. The results of surrogate, MS/MSD, chemical recovery, and LCS analyses, when expressed in terms of percent recovery, demonstrate the accuracy of the method. Accuracy results for all methods and matrices are predominantly in control. The accuracy results which were out-of-control are not significant for any one compound, method, or matrix and do not represent a negative impact to data quality. Therefore, overall accuracy for this sampling event was acceptable.

Representativeness. Sample data are believed to be representative of the site conditions prevailing at the time of sample collection because most of the samples were properly collected, stored, and preserved. All samples were analyzed within holding time. The sample obtained from well S-82 for dissolved metals analyses was received at the laboratory without preservative. The laboratory corrected the pH to <2. Data quality was not adversely affected. Although blank contamination did occur (mostly with common lab contaminants), sample data quality was not adversely affected.

Comparability. All samples were reported in industry-standard units. Water reporting units were micrograms per liter (µg/L), milligrams per liter (mg/L) or picocuries per liter (pCi/L). Analytical protocols for the methods were adhered to (with the exceptions noted in this report) and analytical results are considered comparable.

Completeness is defined as the percentage of laboratory measurements judged to be valid on a method-by-method basis. Valid data are defined as all data and/or qualified data which meet the DQOs for this project. Data completeness is expressed as percent complete (PC), which is calculated as follows: (the number of rejected samples per compound ÷ total number of samples per compound) X 100. Completeness is 100%, understanding that all results qualified with U, UJ or J are usable to meet the project objectives of this sampling event. The goal for meeting analytical holding times was 100% completeness and was met for all samples.

Sensitivity was evaluated using the RLs and MDLs for each sample as compared to project maximum allowable RLs. The laboratory RLs met required RL limits for most compounds except when adjusted for sample dilution. For radionuclides, when the sample results are greater than the MDA but have a combined standard uncertainty less than 50% of the sample activity,

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the sample is qualified with a J. This is an indication that the value is near the MDA and has a relatively large combined standard uncertainty compared to the sample result.

The groundwater data are of acceptable quality and are considered usable to support the project objectives for this sampling event. Samples are representative of the Site when used in accordance with the validation qualifiers.

5. GROUNDWATER LEVELS

Groundwater is present within the alluvium and bedrock deposits beneath the Site. The edge of the geomorphic floodplain for the Missouri River was evaluated as part of the Supplemental Feasibility Study (EMSI, 2011) and was determined to be located beneath the southeastern portion of the Site (Figure 2). To the northwest of this boundary, the uppermost (shallowest) groundwater occurs within the alluvial deposits. Because alluvium is not present beneath the southeastern portion of the Site, the uppermost groundwater is found in bedrock of the St. Louis Formation.

Water level measurements were obtained from the monitoring wells (Table 1), and these data were used to develop a potentiometric surface (water level) map for the Site (Figure 2). Groundwater within the St. Louis Formation beneath the southern and southeastern boundaries of the Site displayed the highest water level elevations [ranging from approximately 449 to approximately 468 feet (ft) above mean sea level (amsl)], whereas the lowest groundwater elevations (approximately 426 to 428 ft amsl) were present within the alluvial deposits beneath the northern portion of the Site. These data indicate that the overall direction of the hydraulic gradient in the area of the Site is to the northwest, towards the Missouri River.

The water level data also indicate that overall, groundwater within the bedrock generally discharges to the alluvial deposits at the Site (Figure 2). With the exception of the area immediately around the quarry landfills, the water levels in the bedrock (e.g., PZ-208-SS, PZ-201A-SS, PZ-102-SS and PZ-102R-SS) are substantially higher (i.e., approximately 449 to 468 ft amsl) than the water levels in the alluvial deposits (i.e., approximately 426 to 428 ft amsl), indicating that groundwater flows from the bedrock into the alluvium. In addition, water level data obtained from co-located alluvial and bedrock wells support the conclusion that groundwater within the bedrock discharges to the alluvium. The water level data indicate that the water levels within the bedrock wells are generally higher than the water levels in nearby alluvial wells indicating that beneath the Site an upward gradient generally exists from the bedrock to the alluvium. For example, compare the water level elevations between St. Louis Formation well PZ-205-SS (430.71) to that of the co-located alluvial well PZ-205-AS (428.98), or compare the water level elevations between St. Louis Formation well PZ-113-SS (427.57) to that of the co-located alluvial wells PZ-113-AS (427.42) and PZ-113-AD (427.48) (Table 3 and Figure 2).

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Review of water level data obtained from well clusters completed within the alluvial deposits beneath the northern portion of the Site (Table 3) indicates that the relative heights of the water levels within co-located alluvial monitoring wells were variable in April 2013. In some of the well clusters, the highest water levels were found in the shallower alluvial wells that are completed in the upper portion of the alluvium and lower water levels were present in the deeper alluvial wells that are completed near the base of the alluvial deposits (e.g., compare water levels from S-5, I-4, D-3 well cluster near OU-1 Area 1 and the MW-102 and D-6 well cluster near Area 2). The water level data obtained from these well clusters indicate that a slight downward hydraulic gradient was present within the alluvial deposits beneath portions of the Site in April 2013. In other well clusters, the highest water levels occurred in the deeper portions of the alluvial aquifer (e.g., compare water levels from the S-84 and D-85 well cluster near Area 1 and the S-10, I-11 and D-12 well cluster near Area 2). These data indicate that a slight upward hydraulic gradient was present within the alluvial deposits beneath portions of the Site in April 2013.

The hydraulic gradient within the bedrock wells in the southern portion of the Site is relatively steep (as much as 50 ft per 500 ft or 0.1 ft/ft) near the North and South Quarry Landfills, reflecting the effects of ongoing pumping from the landfills. The hydraulic gradient within the alluvial deposit beneath the northern portion of the Site is very flat (approximately 0.0001 to 0.0003 ft/ft). These values are within the range of values reported in the RI (EMSI, 2000). Based on reported average values of 3×10^{-2} to 3×10^{-3} cm/sec (85 to 8.5 ft/day) for the hydraulic conductivity of the alluvium (EMSI, 2000), an assumed effective porosity of 25%, and a hydraulic gradient of 0.0002 ft/ft, the overall velocity of groundwater flow within the alluvium would be approximately 0.0068 to 0.068 ft/day or approximately 2.5 to 25 ft/year.

6. GROUNDWATER SAMPLE RESULTS

This section summarizes the analytical laboratory results for the groundwater samples.

6.1 Radionuclides

The results of the laboratory analyses of the uranium, thorium and radium isotopes are summarized on Tables 4, 5 and 6, respectively. Again, of the 75 wells sampled during this April 2013 sampling event, 23 are OU-1 wells which historically have been sampled for uranium, thorium, and both Radium-226 and Radium-228; while the remaining 52 wells are OU-2 RI wells which were last sampled in 1997 or 2004 and for which sampling included uranium, thorium, and Radium-226 but not Radium-228; or monitoring wells associated with the former Permitted Landfill which was not required to monitor for radiological compounds.

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6.1.1 Uranium

Table 4 presents a summary of the analytical results of the uranium isotopes. The reported results are presented in units of activity (picocuries per liter or pCi/L) which were converted to units of mass (ug/L) using the procedure defined by EPA (2000).

Only one sample (S-53 TOT) contained calculated total uranium mass concentration that exceeded the EPA Maximum Contaminant Level (MCL) of 30 ug/L (Table 4). Monitoring well S-53 is located to the west of the southern portion of the Inactive Sanitary Landfill and the South Quarry Landfill. The dissolved fraction sample obtained from well S-53 contained significantly lower uranium levels compared to the total fraction and a combined dissolved uranium content that was below the EPA MCL (Table 4). The dissolved fraction sample from this well was the second highest uranium result observed (second to the total fraction sample). Due to the limited amount of water in well S-53 this well was sampled without purging the well. The sample was reported to be gray and the turbidity was reported to be 524.2 NTU, which was one of the most turbid samples obtained during the April 2013 sampling and indicates that the sample contained a large fraction of suspended sediment. Please note that this well was dry during the July/August 2012 sampling event and therefore was not sampled as part of that event. In addition, this well was not included in either the OU-1 or the OU-2 RI and FS groundwater sampling programs. Therefore no prior uranium results are available for comparison to the April 2013 results.

With the exception of the total and dissolved fraction samples obtained from monitoring well S-53, the highest levels of uranium detected in the Site groundwater were found in monitoring wells completed in the deeper bedrock formations located to the south (upgradient) of OU-1 Radiological Areas 1 and 2 (e.g., PZ-100-SS total and dissolved, PZ-102-SS total and dissolved, PZ-102R-SS total and dissolved, PZ-103-SS total, and PZ-111-KS total and dissolved). All of these results were below the EPA MCL for uranium.

6.1.2 Thorium

Table 5 presents a summary of the analytical results of the Site groundwater samples for the thorium isotopes. Overall, only low levels (less than 1 pCi/L) of the thorium isotopes were detected in the majority of the wells. The highest total thorium (Thorium-228 plus Thorium-230 plus Thorium-232) value (58.58 J pCi/L) found in the April 2013 sampling event was in the total fraction sample obtained from monitoring well S-53 (Table 5). As previously discussed (Section 6.1.1), due to the limited amount of water in this well, this well was sampled without purging and the sample was highly turbid indicating it contained a large fraction of suspended sediment. In contrast, the dissolved fraction sample from this well contained only a very low level (0.33 J pCi/L) of total thorium. Also as discussed in Section 6.1.1 above, this well was dry during the July/August 2012 sampling event and therefore was not sampled as part of that event. In addition, this well was not included in either the OU-1 or the OU-1 RI or FS groundwater sampling programs.

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Exclusive of the total sample results from well S-53, the total fraction samples obtained from alluvial monitoring well D-85 (Area 1) and upgradient bedrock monitoring wells PZ-102-SS and PZ-103-SS were greater than the levels seen in the other monitoring wells. In all of these wells (e.g., S-53, D-85, PZ-102-SS and PZ-103-SS), the dissolved fraction samples were significantly lower (total thorium content of less than 1 pCi/L) indicating that the thorium occurrences in these wells are most likely associated with the suspended sediment contained within the total fraction samples. There are no federal or State drinking water or other water quality standards for any of the thorium isotopes or for total thorium.

6.1.3 Radium

Table 6 summarizes the analytical results for the radium isotopes (Radium-226 and Radium-228) for the April 2013 groundwater samples. Figures 3 and 4 present the total and dissolved fraction Radium-226 results plotted on the Site base map. Figures 5 and 6 present the total and dissolved fraction Radium-228 results plotted on the Site base map. Figures 7 and 8 present the combined Radium-226 plus Radium-228 results for the total and dissolved fraction samples, respectively.

6.1.3.1 Radium-226

The highest levels of Radium-226 (e.g., greater than 7 pCi/L) detected in the total fraction samples were for samples obtained from upgradient bedrock monitoring wells PZ-101-SS (21.89 J pCi/L) , PZ-102-SS (8.05 J pCi/L), PZ-103-SS (16.68 J pCi/L) PZ-107-SS (7.72 J pCi/L); Area 1 alluvial monitoring well D-85 (9.67 J pCi/L); and Area 1 bedrock monitoring well PZ-115-SS (7.70 J pCi/L) (Table 6 and Figure 3). The highest levels of Radium-226 (e.g., greater than 4 pCi/L) detected in the dissolved fraction samples were obtained from upgradient bedrock monitoring wells PZ-101-SS (23.28 pCi/L), PZ 102-SS (4.58 pCi/L), and PZ-107-SS (5.80 pCi/L) and Area 1 bedrock monitoring well PZ-115-SS (7.35 pCi/L) (Table 6 and Figure 4).

6.1.3.2 Radium-228

The highest level of Radium-228 (e.g. greater than 5 pCi/L) detected in the total fraction samples occurred in upgradient bedrock monitoring wells PZ-102-SS (7.98 J+ pCi/L) and PZ-103-SS (5.28 J pCi/L); Area 1 alluvial monitoring wells S-5 (5.03 J+ pCi/L), D-85 (6.41 J+ pCi/L), and PZ-113-AD (7.01 J+ pCi/L); and Area 2 alluvial monitoring wells D-6 (5.89 J+ pCi/L) and D-83 (5.53 J+ pCi/L) (Table 6 and Figure 5). Overall, the dissolved fraction sample results for Radium-228 were substantially lower than the total fraction sample results. The highest reported levels of Radium-228 (e.g., greater than 2 pCi/L) detected in the dissolved fraction samples occurred in upgradient bedrock monitoring wells MW-1204 (2.47 J+ pCi/L), PZ-101-SS (2.49 J+ pCi/L), and PZ-102-SS (2.35 J+ pCi/L); Area 1 alluvial monitoring wells D-3 (2.72 J+ pCi/L) and PZ-113-AD (2.83 J+ pCi/L); and Area 2 alluvial monitoring wells D-6 (2.70 J+ pCi/L), D-83 (3.78 J+ pCi/L), and D-93 (2.89 pCi/L) (Table 6 and Figure 6).

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6.1.3.3 Combined Radium-226 and -228

Figures 7 and 8 present the combined Radium-226 plus Radium-228 results for the total and dissolved fraction samples, respectively, plotted on the Site base map. The highest combined Radium-226 plus Radium-228 values for the total (unfiltered) fraction samples occurred in upgradient bedrock monitoring wells PZ-101-SS (24.01 pCi/L), PZ-102-SS (16.03 pCi/L), PZ-103-SS (21.96 pCi/L), PZ-104-SD (8.44 pCi/L), and PZ-107-SS (11.08 pCi/L); Area 1 alluvial monitoring wells D-85 (16.08 pCi/L) and PZ-113-AD (9.28 pCi/L); and Area 2 alluvial monitoring well D-83 (8.70 pCi/L) (Table 6 and Figure 7). The highest combined Radium-226 plus Radium-228 values for the dissolved (filtered) fraction samples occurred in upgradient bedrock monitoring wells PZ-101-SS (25.77 pCi/L), PZ-102-SS (6.93 pCi/L), PZ-103-SS (5.42 pCi/L), PZ-104-SD (5.66 pCi/L), PZ-107-SS (7.68 pCi/L), and PZ-110-SS (5.46 pCi/L); Area 1 bedrock monitoring well PZ-115-SS (8.66 pCi/L); and in Area 2 alluvial monitoring well D-83 (5.57 pCi/L) (Table 6 and Figure 8).

A total of 19 of the 75 monitoring wells (including both upgradient and downgradient wells) contained total and dissolved fraction or total fraction only results for combined Radium-226 plus Radium-228 at activity levels that exceeded the EPA maximum contaminant level (MCL) of 5 pCi/L. The combined Radium-226 plus Radium-228 total fraction and dissolved fraction results from eight monitoring wells exceeded the MCL. These eight wells include upgradient bedrock monitoring wells PZ-PZ-101-SS, PZ-102-SS, PZ-103-SS, PZ-104-SD, PZ-107-SS and PZ-110-SS; Area 1 bedrock monitoring well PZ-115-SS, and Area 2 alluvial monitoring well D-83 (Table 6 and Figure 7 and 8). The combined total fraction (but not the dissolved fraction) Radium results in eleven other monitoring wells exceeded the MCL. These eleven monitoring wells include upgradient bedrock wells MW-1204 and PZ-100-SS; Area 1 alluvial monitoring wells S-5, I-68, D-3, D-85, and PZ-113-AD and Area 1 bedrock monitoring well PZ-113-SS; and Area 2 alluvial monitoring wells I-9, D-6 and D-93 (Table 6 and Figure 7).

6.1.3.4 Duplicate Sample Results for Radium

Eight field duplicate samples were collected as part of the field effort (Tables 2 and 7). Field duplicate samples were obtained by filling two sets of sample bottles and submitting the two samples to the laboratories as unique samples. Comparisons of the field duplicate sample results for total and dissolved Radium-226 and Radium-228 are presented on Table 7. Relative percent difference values are provided on Table 7 to assist in the evaluation of the field duplicate sample results.

The highest relative percent differences for the Radium-226 results were obtained from sample pairs that contained the lowest radium activity levels (i.e., less than 1 pCi/l of radium), and generally were associated with values that were qualified by the laboratory or the data validation effort as being estimated values. When the combined standard uncertainty values of the sample

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results are considered, the total Radium-226 results obtained from the duplicate samples were generally equivalent to the original samples.

The Radium-228 results for many of the duplicate samples were non-detect in the original sample, the duplicate sample or both samples (Table 7). In the cases where Radium-228 was detected in both the original and field duplicate sample, the results are generally equivalent (Table 7). In instances where one sample reportedly contained detectable level of Radium-228 but the other sample did not, comparison of the minimum detectable activity (MDA) value for the non-detect result to the detected result in the other sample and considering the combined standard uncertainty of the results indicates that the results, although non-detect for one sample, are generally consistent.

6.1.3.5 Comparison to Prior Radium Sampling Results

Figures 9 and 10 present the historic total and dissolved Radium-226 results obtained for samples collected during the July/August 2012 sampling event, as well as those reported for the OU-1 RI/FS sampling events (McLaren Hart, 1996, and EMSI, 2000 and 2006), and the OU-2 RI/FS sampling events (Herst & Associates, 2005). Because the OU-2 RI/FS samples were only analyzed for Radium-226 (the RIM-associated radium isotope) and not Radium-228, these figures only include results for Radium-226.

6.2 Trace Metals

The groundwater samples were analyzed for 19 trace metals, exclusive of the major chemistry cations (e.g., calcium, magnesium, sodium and potassium). All of the samples were non-detect for beryllium and silver. Selenium was detected in the total fraction samples obtained from alluvial monitoring wells I-11 (21 micrograms per liter [ug/L]), I-62 (30 ug/L) and D-81 (24 ug/L). Cadmium, copper and thallium were only detected in one to six of the 75 wells sampled during April 2013. Results obtained for the other thirteen trace metals are summarized on Table 8.

Arsenic was detected in one or both of the sample fractions (total or dissolved) obtained from 18 of the 75 monitoring wells. The majority of the detected results exceed the drinking water standard of 10 ug/L for arsenic. The highest reported arsenic concentrations (110 to 430 ug/L) were found in alluvial wells S-82, S-84, PZ-112-AS, PZ-114-AS, PZ-303-AS, and PZ-304-AS (Table 8).

The most frequently detected trace metals were iron and manganese which were detected in nearly all of the monitoring wells (Table 8). The majority of the iron results exceed the drinking water standard (which is a secondary standard based on aesthetic considerations) of 300 ug/L. The highest levels of iron (i.e., greater than 50,000 ug/L) were found in the total (unfiltered) and dissolved (filtered) sample fractions obtained from alluvial wells S-10, S-84, D-85, PZ-114-AS, and PZ-303-AS; and the total fraction samples obtained from S-53, S-82, and I-73.

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Nearly all of the manganese results exceed the drinking water standard (a secondary standard based on aesthetic considerations) of 50 ug/L. The highest levels of manganese (i.e., greater than 5,000 micrograms per liter) were found in the total and dissolved sample fractions obtained from alluvial wells S-10, S-53, and PZ-113-AS; and bedrock well PZ-200-SS and in the total fraction samples from alluvial wells I-66 and D-85.

It should be noted that the solubility of arsenic, iron and manganese is largely controlled by their oxidation states, with the reduced form of these metals possessing higher solubility values. Consequently, these metals are commonly detected at solid waste landfills where the anaerobic biodegradation of organic matter and the decreased infiltration of typically oxygen-rich precipitation (recharge) due to the presence of lower permeability landfill cover results in the creation of reducing conditions. The presence of these trace metals can reflect dissolution of the metals from either the waste materials or dissolution of naturally occurring arsenic, iron and manganese within cover soil material contained in the waste materials, or in the soil and bedrock adjacent to the waste deposits.

6.3 Volatile Organic Compounds

Table 9 presents a summary of the primary VOCs that were detected in the groundwater samples. The most commonly detected VOC was benzene, which was reported to be present in 26 of the 75 wells. Other VOCs (exclusive of common laboratory contaminants) that were detected in a number of the groundwater wells included cis-1,2-dichloroethene (detected in 18 of the wells), chlorobenzene (detected in 24 of the wells), methyl-tert-butyl ether [MTBE] (detected in 19 of the wells), and 1,4-dichlorobenzene (detected in 13 of the wells). Other VOCs that were detected include ethyl benzene (detected in 15 of the wells), isopropylbenzene [also known as cumene] (detected in 14 of the wells), xylenes (detected in 11 of the wells), chloroethane (detected in 10 of the wells), and vinyl chloride (detected in 10 of the wells).

Benzene was detected in eleven monitoring wells at concentrations greater than its water quality standard of 5 ug/L. The highest concentrations of benzene were detected in bedrock monitoring wells PZ-104-SS and PZ-104-SD, and alluvial monitoring well PZ-205-AS, all of which are located adjacent to the South Quarry Landfill. These are the same wells in which the higher levels of other hydrocarbon constituents (e.g., ethyl benzene, cumene, xylenes and MTBE) were detected, although the highest xylene levels were found in PZ-303-AS.

7. REFERENCES

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Tables

Table 1: Groundwater Level Measurements, April 2, 2013

Well	Top of Casing (TOC) Elevation (ft. amsl)**	Water Level (ft. below TOC)	Water Level Elevation (ft. amsl)
S-5	466.45	37.63	428.82
S-8	443.83	16.73	427.10
S-10	480.06	52.75	427.31
S-53	444.18	16.35	427.83
S-61	449.52	22.33	427.19
S-82	449.94	22.44	427.50
S-84	456.78	29.43	427.35
I-4	466.18	38.77	427.41
I-9	450.76	22.30	428.46
I-11	480.01	52.77	427.24
I-62	446.37	18.90	427.47
I-65	441.53	14.43	427.10
I-66	441.87	14.57	427.30
I-67	441.78	14.51	427.27
I-68	450.39	22.91	427.48
I-73	461.40	33.43	427.97
D-3	467.92	40.55	427.37
D-6	447.09	20.12	426.97
D-12	479.67	52.35	427.32
D-13	470.53	43.24	427.29
D-14	483.09	-	N/A
D-81	450.87	22.82	428.05
D-83	448.55	21.15	427.40
D-85	457.06	29.65	427.41
D-87	464.41	37.02	427.39
D-93	449.84	23.28	426.56
LR-100	468.14	15.28	452.86
LR-103	470.54	42.85	427.69
LR-104	459.38	31.62	427.76
LR-105	485.36	32.53	452.83
MW-102	447.90	20.19	427.71
MW-103	437.47	11.44	426.03
MW-104	440.91	12.81	428.10
MW-1204	485.53	27.84	457.69
PZ-100-KS	485.61	26.32	459.29
PZ-100-SD	485.72	35.87	449.85
PZ-100-SS	485.75	34.57	451.18
PZ-101-SS	491.26	53.15	438.11
PZ-102R-SS	485.62	28.79	456.83
PZ-102-SS	483.90	27.67	456.23
PZ-103-SS	483.56	9.58	473.98
PZ-104-KS	483.95	18.71	465.24

Table 1: Groundwater Level Measurements, April 2, 2013

Well	Top of Casing (TOC) Elevation (ft. amsl)**	Water Level (ft. below TOC)	Water Level Elevation (ft. amsl)
PZ-104-SD	483.51	22.01	461.50
PZ-104-SS	483.45	21.25	462.20
PZ-105-SS	483.51	24.19	459.32
PZ-106-KS	464.20	4.59	459.61
PZ-106-SD	463.36	14.67	448.69
PZ-106-SS	462.71	13.57	449.14
PZ-107-SS	464.56	36.30	428.26
PZ-109-SS	458.55	27.53	431.02
PZ-110-SS	461.15	33.06	428.09
PZ-111-KS	465.56	9.20	456.36
PZ-111-SD	466.46	38.96	427.50
PZ-112-AS	462.50	35.09	427.41
PZ-113-AD	461.54	34.06	427.48
PZ-113-AS	461.40	33.98	427.42
PZ-113-SS	461.77	34.20	427.57
PZ-114-AS	451.26	23.37	427.89
PZ-115-SS	452.27	15.88	436.39
PZ-116-SS	484.85	27.25	457.60
PZ-200-SS	485.57	30.58	454.99
PZ-201A-SS	480.20	12.39	467.81
PZ-202-SS	481.02	14.08	466.94
PZ-203-SS	486.44	24.94	461.50
PZ-204A-SS	462.60	6.76	455.84
PZ-204-SS	464.79	4.95	459.84
PZ-205-AS	459.95	30.97	428.98
PZ-205-SS	461.73	31.02	430.71
PZ-206-SS	460.29	29.33	430.96
PZ-207-AS	462.49	35.11	427.38
PZ-208-SS	474.19	22.04	452.15
PZ-302-AI	450.17	23.11	427.06
PZ-302-AS	451.33	23.40	427.93
PZ-303-AS	453.08	25.21	427.87
PZ-304-AI	453.86	26.05	427.81
PZ-304-AS	453.61	25.80	427.81
PZ-305-AI	459.83	32.14	427.69

** Survey data provided by Aquaterra in a spreadsheet dated 9/14/2012.
amsl = above mean sea level

Table 2: Wells Sampled During April 2013 Groundwater Monitoring Effort

Well
PZ-100-SS
PZ-100-SD
PZ-100-KS
PZ-101-SS
PZ-102-SS
PZ-102R-SS
PZ-103-SS
PZ-104-SS
PZ-104-SD
PZ-104-KS
PZ-105-SS
PZ-106-SS
PZ-106-SD
PZ-106-KS
PZ-107-SS
PZ-109-SS
PZ-110-SS
PZ-111-SD
PZ-111-KS
PZ-112-AS
PZ-113-AS
PZ-113-AD
PZ-113-SS
PZ-114-AS
PZ-115-SS
PZ-116-SS
PZ-200-SS
PZ-201A-SS
PZ-202-SS
PZ-203-SS
PZ-204-SS
PZ-204A-SS
PZ-205-AS
PZ-205-SS
PZ-206-SS
PZ-207-AS
PZ-208-SS
PZ-302-AI
PZ-303-AS
PZ-304-AS
PZ-304-AI
PZ-305-AI

Well
LR-100
LR-103
LR-104
LR-105
MW-103
MW-104
MW-1204
S-5
S-8
S-10
S-53
S-61
S-82
S-84
I-4
I-9
I-11
I-62
I-65
I-66
I-67
I-68
I-73
D-3
D-6
D-12
D-13
D-14
D-81
D-83
D-85
D-87
D-93
Total = 75 wells

Duplicate Samples	
DUP-01	I-62
DUP-02	D-12
DUP-03	I-67
DUP-04	PZ-305-AI
DUP-05	I-9
DUP-06	PZ-104-SS
DUP-07	MW-1204
DUP-08	I-65

EPA Split Samples
S-5
S-82
I-9
D-3
D-6
D-83
D-85
D-93
PZ-101-SS
PZ-102-SS
PZ-104-=SD
PZ-113-AD

Well Legend	
S prefix or AS suffix	Shallow alluvial well
I prefix or AI suffix	Intermediate alluvial well
D prefix or AD suffix	Deep intermediate well
SS suffix	St. Louis Fm. bedrock well
SD suffix	Salem Fm. bedrock well
KS suffix	Keokuk Fm. Bedrock well

6/18/2013

Table 3: Vertical Groundwater Gradients, April 2, 2013

Well	Water Level Elevation (ft amsl)	Original Top of Screen Elevation (ft amsl)	Original Bottom of Screen Elevation (ft amsl)	Midpoint Elevation of Screen Interval (ft amsl)	Head Difference (ft)	Difference in Screen Midpoint Elevations (ft)	Vertical Gradient (ft/ft)
Alluvial Well Clusters							
S-5	428.82	435.70	425.70	430.70	1.41	36.20	0.0390
I-4	427.41	399.50	389.50	394.50	0.04	28.80	0.0014
D-3	427.37	370.70	360.70	365.70	1.45	65.00	0.0223
MW-102	427.71	432.18	422.18	427.18	0.74	84.28	0.0088
D-6	426.97	347.90	337.90	342.90			
S-10	427.31	445.50	425.50	435.50	0.07	43.40	0.0016
I-11	427.24	397.10	387.10	392.10	-0.08	53.40	-0.0015
D-12	427.32	343.70	333.70	338.70	-0.01	96.80	-0.0001
S-8	427.10	434.80	414.80	424.80	-0.37	19.70	-0.0188
I-62	427.47	410.10	400.10	405.10	0.07	231.40	0.0003
D-83	427.40	0.00	347.40	173.70	-0.30	251.10	-0.0012
S-84	427.35	432.00	422.00	427.00	-0.06	241.45	-0.0002
D-85	427.41	0.00	371.10	185.55			
S-82	427.50	0.00	422.20	211.10	-0.96	-189.30	0.0051
I-9	428.46	405.40	395.40	400.40	1.90	29.70	0.0640
D-93	426.56	380.70	360.70	370.70	0.94	-159.60	-0.0059
PZ-302-AS	427.93	-406.65	427.50	10.43	0.87	9.55	0.0911
PZ-302-AI	427.06	-405.84	407.60	0.88			
PZ-304-AS	427.81	434.30	424.50	429.40	0.00	21.70	0.0000
PZ-304-AI	427.81	412.60	402.80	407.70			
Alluvial and Bedrock Well Clusters							
PZ-113-AS	427.42	431.00	421.20	426.10	-0.06	69.70	-0.0009
PZ-113-AD	427.48	361.30	351.50	356.40	-0.09	49.87	-0.0018
PZ-113-SS	427.57	311.43	301.63	306.53	-0.15	119.57	-0.0013
PZ-205-AS	428.98	420.75	410.95	415.85	-1.73	49.82	-0.0347
PZ-205-SS	430.71	370.93	361.13	366.03			

Notes: Positve values for vertical gradient indicate a downward gradient whereas negative values indicate an upward gradient.

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
S-5 DIS	4/11/13	0.01	0.14	0.41	UJ	0.18	0.30	0.50	UJ	0.03	0.14	0.36	UJ	ND		1.30
S-5 TOT	4/11/13	-0.06	0.20	0.53	UJ	0.13	0.34	0.70	UJ	-0.11	0.22	0.75	UJ	ND		2.56
S-8 DIS	4/4/13	0.85	0.25	0.06	J	0.09	0.09	0.11	U	0.55	0.19	0.07		1.40	*	1.69
S-8 TOT	4/4/13	0.84	0.25	0.09		0.09	0.08	0.08	J	0.94	0.26	0.09		1.87		2.84
S-10 DIS	4/4/13	0.13	0.10	0.11	J	0.02	0.04	0.09	U	0.09	0.09	0.11	U	0.13	*	0.37
S-10 TOT	4/4/13	0.23	0.12	0.08	J	0.03	0.05	0.08	U	0.24	0.12	0.08		0.47	*	0.75
S-53 DIS	4/16/13	5.90	0.92	0.07	J	0.40	0.16	0.08	J	4.74	0.77	0.05	J	11.04		14.31
S-53 TOT	4/16/13	45.30	20.2	3.63	J	11.37	7.58	4.81	J	53.49	23.2	3.29	J	110.2		164.6
S-61 DIS	4/5/13	0.85	0.25	0.07		0.13	0.10	0.08	J	0.71	0.23	0.07		1.69		2.18
S-61 TOT	4/5/13	0.76	0.24	0.09		0.03	0.07	0.12	U	0.74	0.24	0.13		1.50	*	2.26
S-82 DIS	4/9/13	0.91	0.32	0.14	J	0.02	0.06	0.12	UJ	0.81	0.30	0.14	J	1.72	*	2.47
S-82 TOT	4/9/13	1.26	0.42	0.17	J	0.12	0.13	0.17	UJ	1.09	0.38	0.11	J	2.35	*	3.33
S-84 DIS	4/11/13	0.05	0.08	0.13	UJ	0.02	0.06	0.13	UJ	0.06	0.09	0.15	UJ	0.06	*	0.19
S-84 TOT	4/11/13	0.24	0.16	0.13	J	-0.01	0.06	0.13	UJ	0.19	0.14	0.13	J	0.19	*	0.56
I-4 DIS	4/12/13	0.09	0.29	0.61	U	0.25	0.34	0.52	UJ	-0.08	0.17	0.51	UJ	ND		1.76
I-4 TOT	4/12/13	1.05	0.58	0.32	J	0.27	0.32	0.39	U	0.14	0.27	0.50	U	1.05	*	1.67
I-9 DIS	4/9/13	0.20	0.12	0.07	J	0.10	0.09	0.09	J	0.19	0.12	0.07	J	0.49		0.61
I-9 FD DIS	4/9/13	0.14	0.12	0.14	J	0.06	0.10	0.17	UJ	0.13	0.11	0.10	J	0.27	*	0.47
I-9 TOT	4/9/13	0.14	0.12	0.11	J	0.00	0.08	0.18	UJ	0.04	0.07	0.10	UJ	0.14	*	0.38
I-9 FD TOT	4/9/13	0.29	0.16	0.09	J	0.10	0.12	0.16	UJ	0.21	0.14	0.13	J	0.50	*	0.70
I-11 DIS	4/4/13	1.24	0.43	0.18	J	0.07	0.10	0.15	UJ	1.08	0.39	0.12	J	2.32	*	3.29
I-11 TOT	4/4/13	1.07	0.35	0.09	J	0.06	0.09	0.17	UJ	0.71	0.27	0.14	J	1.78	*	2.19
I-62 DIS	4/4/13	0.18	0.10	0.05	J	0.09	0.08	0.09	J	0.22	0.11	0.08		0.49		0.70
I-62 FD DIS	4/4/13	0.20	0.11	0.07	J	0.03	0.06	0.10	U	0.14	0.09	0.08	J	0.34	*	0.46
I-62 TOT	4/4/13	0.22	0.11	0.10		0.05	0.06	0.09	UJ	0.22	0.11	0.08		0.44	*	0.70
I-62 FD TOT	4/4/13	0.26	0.11	0.05	J	0.01	0.03	0.06	UJ	0.12	0.07	0.05	J	0.38	*	0.39

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
I-65 DIS	4/16/13	0.64	0.24	0.12	J	0.05	0.07	0.10	UJ	0.57	0.23	0.10	J	1.21	*	1.74
I-65 FD DIS	4/16/13	0.60	0.19	0.07	J	0.04	0.05	0.07	UJ	0.57	0.18	0.06	J	1.17	*	1.73
I-65 TOT	4/16/13	0.91	0.26	0.07		0.00	0.05	0.11	U	0.85	0.25	0.09	J	1.76	*	2.58
I-65 FD TOT	4/16/13	0.67	0.22	0.10		0.08	0.08	0.09	U	0.51	0.19	0.13	J	1.18	*	1.56
I-66 DIS	4/5/13	0.76	0.23	0.07		0.10	0.09	0.07	J	0.60	0.20	0.06		1.46		1.83
I-66 TOT	4/5/13	0.76	0.22	0.06	J	0.26	0.14	0.10	J	0.58	0.19	0.08	J	1.60		1.85
I-67 DIS	4/5/13	0.51	0.18	0.08		0.16	0.11	0.08	J	0.43	0.16	0.07		1.10		1.36
I-67 FD DIS	4/5/13	0.97	0.29	0.09	J	0.10	0.10	0.14	U	0.79	0.25	0.11		1.76	*	2.42
I-67 TOT	4/5/13	0.86	0.25	0.08		0.05	0.06	0.08	U	0.60	0.20	0.06		1.46	*	1.82
I-67 FD TOT	4/5/13	0.59	0.20	0.07	J	0.05	0.06	0.08	U	0.82	0.24	0.06		1.41	*	2.48
I-68 DIS	4/9/13	2.58	0.53	0.09		0.18	0.12	0.12	J	2.23	0.48	0.12		4.99		6.73
I-68 TOT	4/9/13	2.73	0.59	0.10		0.24	0.15	0.11	J	2.42	0.54	0.12	J	5.39		7.32
I-73 DIS	4/12/13	0.99	0.36	0.19	J	0.36	0.22	0.16	J	0.65	0.28	0.16	J	2.00		2.10
I-73 TOT	4/12/13	1.50	0.38	0.07		0.29	0.16	0.09	J	1.64	0.40	0.11		3.43		5.02
D-3 DIS	4/11/13	0.15	0.12	0.13	J	0.10	0.10	0.12	UJ	0.07	0.08	0.12	UJ	0.15	*	0.41
D-3 TOT	4/11/13	-0.02	0.07	0.18	UJ	0.11	0.14	0.17	UJ	0.02	0.06	0.15	UJ	ND		0.53
D-6 DIS	4/9/13	0.25	0.12	0.06		0.00	0.03	0.07	U	0.25	0.12	0.06		0.50	*	0.78
D-6 TOT	4/9/13	0.22	0.12	0.08	J	0.02	0.06	0.13	U	0.12	0.09	0.07	J	0.34	*	0.42
D-12 DIS	4/4/13	0.24	0.16	0.12	J	0.08	0.10	0.14	UJ	0.09	0.10	0.10	UJ	0.24	*	0.36
D-12 FD DIS	4/4/13	0.18	0.10	0.07	J	0.12	0.09	0.07	J	0.13	0.09	0.07	J	0.43		0.44
D-12 TOT	4/4/13	0.13	0.13	0.16	UJ	0.07	0.11	0.20	UJ	0.07	0.09	0.11	UJ	ND		0.42
D-12 FD TOT	4/4/13	0.16	0.10	0.08	J	0.01	0.04	0.10	U	0.10	0.09	0.12	U	0.16	*	0.40
D-13 DIS	4/4/13	0.17	0.10	0.06	J	0.04	0.05	0.07	UJ	0.11	0.08	0.05	J	0.28	*	0.36
D-13 TOT	4/4/13	0.23	0.13	0.09	J	0.02	0.06	0.13	U	0.25	0.14	0.08	J	0.48	*	0.81
D-14 DIS	4/12/13	0.27	0.59	1.15	UJ	0.21	0.50	1.05	UJ	0.71	0.82	1.07	UJ	ND		3.67
D-14 TOT	4/12/13	0.75	0.40	0.26	J	-0.02	0.11	0.26	UJ	1.05	0.47	0.18	J	1.80	*	3.25

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
D-81 DIS	4/3/13	1.49	0.33	0.06	J	0.20	0.12	0.09	J	1.27	0.30	0.07		2.96		3.88
D-81 TOT	4/3/13	1.57	0.33	0.05	J	0.14	0.09	0.06	J	1.21	0.27	0.05	J	2.92		3.67
D-83 DIS	4/9/13	0.04	0.08	0.15	UJ	0.02	0.07	0.19	UJ	0.05	0.08	0.14	UJ	ND		0.51
D-83 TOT	4/9/13	0.03	0.08	0.16	UJ	-0.02	0.07	0.18	UJ	-0.05	0.09	0.27	UJ	ND		0.89
D-85 DIS	4/11/13	0.37	0.15	0.06		0.01	0.03	0.07	U	0.14	0.09	0.06	J	0.51	*	0.45
D-85 TOT	4/11/13	1.73	0.38	0.09		0.24	0.13	0.09	J	2.62	0.51	0.06		4.59		7.92
D-87 DIS	4/9/13	0.26	0.15	0.10	J	0.02	0.05	0.12	U	0.11	0.10	0.12	U	0.26	*	0.41
D-87 TOT	4/9/13	0.40	0.20	0.14	J	0.03	0.08	0.17	UJ	0.10	0.10	0.12	UJ	0.40	*	0.44
D-93 DIS	4/9/13	0.30	0.14	0.08		0.04	0.06	0.09	U	0.15	0.10	0.07	J	0.45	*	0.49
D-93 TOT	4/9/13	0.39	0.16	0.09		0.03	0.05	0.10	U	0.16	0.12	0.15	J	0.55	*	0.52
LR-100 DIS	4/3/13	0.08	0.07	0.07	J	0.12	0.10	0.11	J	0.17	0.10	0.06	J	0.37		0.56
LR-100 TOT	4/3/13	0.14	0.14	0.15	UJ	0.09	0.15	0.27	UJ	0.06	0.10	0.17	UJ	ND		0.63
LR-103 DIS	4/3/13	0.22	0.14	0.12	J	0.05	0.07	0.10	U	0.36	0.18	0.12		0.58	*	1.12
LR-103 TOT	4/3/13	0.07	0.09	0.12	UJ	0.02	0.06	0.15	UJ	0.19	0.14	0.10	J	0.19	*	0.64
LR-104 DIS	4/4/13	2.72	0.49	0.06	J	0.16	0.10	0.09	J	1.94	0.38	0.05		4.82		5.85
LR-104 TOT	4/4/13	2.60	0.48	0.05	J	0.16	0.10	0.09	J	2.11	0.41	0.06		4.87		6.36
LR-105 DIS	4/3/13	0.31	0.23	0.19	J	0.04	0.10	0.21	UJ	0.02	0.08	0.21	UJ	0.31	*	0.72
LR-105 TOT	4/3/13	0.04	0.24	0.66	UJ	-0.10	0.30	0.82	UJ	-0.30	0.29	0.98	UJ	ND		3.30
MW-103 DIS	4/5/13	3.17	0.60	0.06		0.27	0.14	0.11	J	3.00	0.57	0.09		6.44		9.06
MW-103 TOT	4/5/13	4.07	0.73	0.12		0.37	0.17	0.10		3.72	0.68	0.09		8.16		11.25
MW-104 DIS	4/5/13	1.42	0.41	0.13	J	0.16	0.14	0.16	J	1.18	0.36	0.13	J	2.76		3.59
MW-104 TOT	4/5/13	1.45	0.37	0.08		0.14	0.11	0.09	J	1.13	0.31	0.07		2.72		3.43
MW-1204 DIS	4/12/13	0.05	0.08	0.15	UJ	0.07	0.09	0.12	UJ	0.05	0.07	0.12	UJ	ND		0.41
MW-1204 FD DIS	4/12/13	0.23	0.19	0.17	J	0.04	0.12	0.26	UJ	0.13	0.14	0.15	UJ	0.23	*	0.57
MW-1204 TOT	4/12/13	0.06	0.07	0.11	U	0.01	0.05	0.12	U	0.06	0.07	0.10	U	ND		0.35
MW-1204 FD TOT	4/12/13	0.16	0.16	0.17	UJ	-0.01	0.10	0.21	UJ	0.03	0.08	0.17	UJ	ND		0.60

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-100-KS DIS	4/16/13	0.07	0.06	0.05	J	0.01	0.03	0.06	UJ	0.10	0.07	0.07	J	0.17	*	0.33
PZ-100-KS TOT	4/16/13	0.16	0.09	0.07	J	0.03	0.04	0.07	U	0.06	0.06	0.06	J	0.22	*	0.21
PZ-100-SD DIS	4/5/13	0.36	0.13	0.05	J	0.01	0.03	0.06	UJ	0.36	0.13	0.05	J	0.72	*	1.10
PZ-100-SD TOT	4/5/13	0.45	0.16	0.06	J	0.01	0.03	0.07	UJ	0.27	0.12	0.07	J	0.72	*	0.84
PZ-100-SS DIS	4/5/13	6.01	0.90	0.05	J	0.21	0.11	0.08	J	2.35	0.43	0.07	J	8.57		7.10
PZ-100-SS TOT	4/5/13	5.70	0.90	0.06	J	0.32	0.14	0.06	J	2.30	0.44	0.06	J	8.32		7.00
PZ-101-SS DIS	4/12/13	1.29	0.58	0.27	J	0.13	0.21	0.38	UJ	0.44	0.31	0.24	J	1.73	*	1.49
PZ-101-SS TOT	4/12/13	0.73	0.45	0.34	J	0.17	0.24	0.37	UJ	0.55	0.37	0.23	J	1.28	*	1.81
PZ-102R-SS DIS	4/11/13	5.54	0.87	0.07	J	0.44	0.17	0.09	J	3.40	0.59	0.06	J	9.38		10.33
PZ-102R-SS TOT	4/11/13	4.85	0.77	0.06	J	0.30	0.14	0.09	J	3.17	0.55	0.09	J	8.32		9.58
PZ-102-SS DIS	4/11/13	5.76	0.94	0.08	J	0.25	0.13	0.10	J	3.35	0.61	0.08	J	9.36		10.10
PZ-102-SS TOT	4/11/13	5.70	0.91	0.06	J	0.33	0.15	0.07	J	4.73	0.78	0.05	J	10.76		14.25
PZ-103-SS DIS	4/8/13	1.05	0.25	0.06	J	0.07	0.06	0.06	J	0.74	0.20	0.06	J	0.74	*	2.24
PZ-103-SS TOT	4/8/13	4.47	0.71	0.05	J	0.36	0.14	0.06	J	4.77	0.74	0.05	J	9.60		14.38
PZ-104-KS DIS	4/11/13	0.49	0.17	0.08		0.02	0.05	0.09	U	0.20	0.10	0.06		0.69	*	0.64
PZ-104-KS TOT	4/11/13	0.43	0.16	0.08	J	-0.01	0.03	0.07	UJ	0.21	0.11	0.07	J	0.64	*	0.66
PZ-104-SD DIS	4/11/13	0.26	0.25	0.28	UJ	0.05	0.12	0.25	UJ	0.23	0.22	0.23	J	0.23	*	0.80
PZ-104-SD TOT	4/11/13	0.18	0.35	0.65	UJ	0.46	0.60	0.91	UJ	0.20	0.35	0.59	UJ	ND		2.18
PZ-104-SS DIS	4/11/13	0.13	0.08	0.06	J	0.02	0.04	0.07	UJ	0.17	0.09	0.04	J	0.30	*	0.54
PZ-104-SS FD DIS	4/11/13	0.41	0.28	0.22	J	0.09	0.16	0.30	UJ	0.27	0.23	0.19	J	0.68	*	0.94
PZ-104-SS TOT	4/11/13	0.22	0.11	0.07	J	0.01	0.03	0.07	UJ	0.09	0.07	0.07	J	0.31	*	0.30
PZ-104-SS FD TOT	4/11/13	0.77	0.55	0.54	J	0.26	0.37	0.56	UJ	0.18	0.30	0.51	UJ	0.77	*	1.78
PZ-105-SS DIS	4/4/13	2.58	0.48	0.07	J	0.08	0.07	0.09	UJ	1.42	0.32	0.09	J	4.00	*	4.27
PZ-105-SS TOT	4/4/13	2.62	0.49	0.08	J	0.11	0.09	0.09	J	1.64	0.35	0.06	J	4.37		4.94
PZ-106-KS DIS	4/15/13	2.02	0.40	0.06	J	0.09	0.08	0.09	J	0.73	0.20	0.07	J	2.84		2.22
PZ-106-KS TOT	4/15/13	2.25	0.43	0.05	J	0.07	0.07	0.09	UJ	0.86	0.23	0.07	J	3.11	*	2.60

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-106-SD DIS	4/9/13	0.43	0.16	0.08	J	0.03	0.05	0.08	UJ	0.20	0.11	0.08	J	0.63	*	0.63
PZ-106-SD TOT	4/9/13	0.32	0.13	0.07	J	0.06	0.06	0.07	UJ	0.31	0.13	0.06	J	0.63	*	0.96
PZ-106-SS DIS	4/9/13	0.61	0.17	0.05	J	0.12	0.08	0.05	J	0.34	0.13	0.04	J	1.07		1.07
PZ-106-SS TOT	4/9/13	0.59	0.17	0.05	J	0.05	0.05	0.06	UJ	0.38	0.14	0.05	J	0.97	*	1.16
PZ-107-SS DIS	4/12/13	1.64	0.41	0.12		0.19	0.13	0.10	J	1.05	0.31	0.16		2.88		3.22
PZ-107-SS TOT	4/12/13	1.68	0.37	0.08		0.16	0.10	0.07	J	1.27	0.30	0.07		3.11		3.86
PZ-109-SS DIS	4/11/13	1.38	0.31	0.07	J	0.04	0.05	0.06	UJ	0.66	0.20	0.06	J	2.04	*	1.99
PZ-109-SS TOT	4/11/13	1.18	0.28	0.06	J	0.12	0.09	0.07	J	0.52	0.17	0.07	J	1.82		1.60
PZ-110-SS DIS	4/4/13	0.08	0.08	0.12	U	0.04	0.07	0.13	U	0.08	0.08	0.09	U	ND		0.33
PZ-110-SS TOT	4/4/13	0.13	0.10	0.09	J	0.10	0.09	0.10	J	0.14	0.10	0.10	J	0.37		0.46
PZ-111-KS DIS	4/9/13	7.01	1.02	0.05	J	0.26	0.12	0.06	J	2.79	0.48	0.04	J	10.06		8.43
PZ-111-KS TOT	4/9/13	7.07	1.05	0.05	J	0.30	0.14	0.07	J	3.10	0.54	0.05	J	10.47		9.38
PZ-111-SD DIS	4/4/13	0.43	0.15	0.06	J	0.02	0.04	0.07	UJ	0.27	0.12	0.07	J	0.70	*	0.84
PZ-111-SD TOT	4/4/13	0.41	0.15	0.07	J	0.03	0.04	0.06	UJ	0.18	0.10	0.07	J	0.59	*	0.56
PZ-112-AS DIS	4/12/13	0.26	0.27	0.28	U	0.00	0.23	0.50	U	0.27	0.30	0.41	U	ND		1.45
PZ-112-AS TOT	4/12/13	0.08	0.24	0.51	U	0.06	0.17	0.40	U	0.09	0.19	0.38	U	ND		1.32
PZ-113-AD DIS	4/11/13	0.06	0.07	0.10	U	0.09	0.10	0.14	U	-0.02	0.04	0.15	U	ND		0.51
PZ-113-AD TOT	4/11/13	0.29	0.27	0.30	UJ	-0.02	0.13	0.32	UJ	0.15	0.22	0.35	UJ	ND		1.19
PZ-113-AS DIS	4/12/13	0.61	0.20	0.07		0.07	0.08	0.11	U	0.48	0.18	0.09		1.09	*	1.48
PZ-113-AS TOT	4/12/13	0.92	0.27	0.07		0.22	0.14	0.12	J	0.79	0.25	0.10		1.93		2.46
PZ-113-SS DIS	4/12/13	1.83	0.37	0.06	J	0.10	0.08	0.08	J	1.21	0.28	0.05	J	3.14		3.65
PZ-113-SS TOT	4/12/13	2.60	0.48	0.08	J	0.29	0.14	0.08	J	1.76	0.36	0.07	J	4.65		5.38
PZ-114-AS DIS	4/8/13	0.08	0.10	0.13	UJ	0.03	0.08	0.18	UJ	0.07	0.11	0.19	UJ	ND		0.65
PZ-114-AS TOT	4/8/13	0.20	0.12	0.10	J	0.06	0.07	0.10	U	0.10	0.09	0.12	U	0.20	*	0.40
PZ-115-SS DIS	4/5/13	2.30	0.45	0.06	J	0.18	0.11	0.10	J	1.55	0.35	0.08	J	4.03		4.70
PZ-115-SS TOT	4/5/13	2.51	0.47	0.05	J	0.14	0.10	0.09	J	1.69	0.36	0.07	J	4.34		5.10

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-116-SS DIS	4/12/13	5.29	0.81	0.05	J	0.40	0.15	0.06	J	1.78	0.35	0.07	J	7.47		5.49
PZ-116-SS TOT	4/12/13	5.69	0.89	0.06	J	0.41	0.16	0.06	J	1.62	0.34	0.06	J	7.72		5.02
PZ-200-SS DIS	4/5/13	0.53	0.18	0.09		0.04	0.06	0.09	U	0.58	0.19	0.06		1.11	*	1.77
PZ-200-SS TOT	4/5/13	0.54	0.18	0.08		0.06	0.07	0.07	U	0.52	0.18	0.06		1.06	*	1.58
PZ-201A-SS DIS	4/8/13	2.22	0.44	0.08	J	0.15	0.10	0.07	J	1.58	0.34	0.07	J	3.95		4.78
PZ-201A-SS TOT	4/8/13	2.48	0.50	0.08		0.13	0.10	0.08	J	1.33	0.33	0.07		3.94		4.02
PZ-202-SS DIS	4/12/13	1.62	0.34	0.05	J	0.05	0.06	0.06	UJ	0.63	0.18	0.05	J	2.25	*	1.90
PZ-202-SS TOT	4/12/13	1.69	0.36	0.07	J	0.13	0.09	0.09	J	0.78	0.22	0.08	J	2.60		2.38
PZ-203-SS DIS	4/5/13	3.16	0.57	0.08		0.13	0.10	0.11	J	0.43	0.16	0.11		3.72		1.34
PZ-203-SS TOT	4/5/13	3.29	0.55	0.07	J	0.13	0.09	0.06	J	0.47	0.15	0.07	J	3.89		1.46
PZ-204A-SS DIS	4/8/13	3.10	0.57	0.08		0.08	0.07	0.07	J	2.46	0.48	0.08		5.64		7.37
PZ-204A-SS TOT	4/8/13	3.44	0.61	0.08		0.32	0.15	0.09		2.91	0.54	0.06		6.67		8.82
PZ-204-SS DIS	4/9/13	3.50	0.57	0.06	J	0.13	0.08	0.05	J	1.76	0.34	0.05	J	5.39		5.30
PZ-204-SS TOT	4/9/13	3.20	0.56	0.06	J	0.14	0.09	0.06	J	2.47	0.46	0.05	J	5.81		7.42
PZ-205-AS DIS	4/8/13	0.18	0.11	0.08	J	0.08	0.08	0.09	U	0.15	0.10	0.07	J	0.33	*	0.49
PZ-205-AS TOT	4/8/13	0.30	0.14	0.07	J	0.05	0.07	0.10	U	0.06	0.07	0.08	U	0.30	*	0.28
PZ-205-SS DIS	4/8/13	0.44	0.14	0.04		0.05	0.05	0.05	J	0.40	0.14	0.04	J	0.89		1.21
PZ-205-SS TOT	4/8/13	0.70	0.20	0.06		0.16	0.10	0.09	J	0.48	0.16	0.05	J	1.34		1.50
PZ-206-SS DIS	4/8/13	0.20	0.11	0.08	J	0.04	0.06	0.09	U	0.08	0.07	0.07	J	0.28	*	0.28
PZ-206-SS TOT	4/8/13	0.20	0.11	0.08	J	0.02	0.04	0.08	U	0.05	0.07	0.12	U	0.20	*	0.39
PZ-207-AS DIS	4/3/13	0.32	0.24	0.24	J	0.20	0.22	0.30	UJ	0.15	0.16	0.17	UJ	0.32	*	0.65
PZ-207-AS TOT	4/3/13	0.18	0.15	0.18	J	0.07	0.12	0.22	UJ	0.07	0.10	0.16	UJ	0.18	*	0.58
PZ-208-SS DIS	4/12/13	1.69	0.40	0.09		0.09	0.09	0.09	J	1.23	0.32	0.07		3.01		3.71
PZ-208-SS TOT	4/12/13	1.94	0.40	0.07	J	0.11	0.08	0.07	J	1.36	0.31	0.06	J	3.41		4.10
PZ-302-AI DIS	4/3/13	4.02	0.70	0.08	J	0.11	0.09	0.07	J	2.69	0.52	0.08		6.82		8.07
PZ-302-AI TOT	4/3/13	4.18	0.70	0.05		0.35	0.15	0.09	J	3.21	0.57	0.08		7.74		9.73

Table 4: Summary of Uranium Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

		Uranium-234				Uranium-235				Uranium-238				TOTAL		
Sample ID	Sample Date	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	U-234 + U-235 + U-238		Total Uranium (ug/l)
PZ-303-AS DIS	4/4/13	0.38	0.17	0.10		0.06	0.08	0.12	U	0.20	0.12	0.09	J	0.58	*	0.65
PZ-303-AS TOT	4/4/13	0.91	0.25	0.06		0.05	0.06	0.07	U	0.80	0.23	0.07		1.71	*	2.42
PZ-304-AI DIS	4/4/13	0.50	0.27	0.24	J	0.16	0.17	0.21	UJ	0.42	0.24	0.18	J	0.92	*	1.35
PZ-304-AI TOT	4/4/13	0.21	0.21	0.28	UJ	-0.05	0.10	0.29	UJ	0.29	0.22	0.21	J	0.29	*	1.00
PZ-304-AS DIS	4/4/13	0.08	0.33	0.84	UJ	0.40	0.68	1.19	UJ	-0.05	0.32	0.76	UJ	ND		2.82
PZ-304-AS TOT	4/4/13	0.85	0.68	0.61	J	0.16	0.44	0.94	UJ	-0.04	0.26	0.61	UJ	0.85	*	2.25
PZ-305-AI DIS	4/5/13	0.44	0.19	0.11		0.15	0.11	0.09	J	0.59	0.22	0.09		1.18		1.83
PZ-305-AI FD DIS	4/5/13	0.31	0.14	0.09		0.08	0.08	0.09	U	0.32	0.14	0.07		0.63	*	1.00
PZ-305-AI TOT	4/5/13	0.69	0.27	0.14		0.09	0.11	0.16	U	0.79	0.29	0.09		1.48	*	2.43
PZ-305-AI FD TOT	4/5/13	0.28	0.16	0.12	J	0.11	0.12	0.15	UJ	0.36	0.19	0.13	J	0.64	*	1.14

Notes:

All values are in units of picoCuries per liter (pCi/l), except as noted.
DIS = dissolved sample (field filtered sample); TOT = total sample (unfiltered sample)
FD - Field duplicate sample
CSU = Combined Standard Uncertainty (2-sigma)
Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value;
UJ = Non-Detect at the estimated reported value; UJ+ = Non-Detect at the estimated reported value which may be biased high;
J = estimated result; J+ = estimated result which may be biased high.
Total U-238 + U-235 +U-234 based on sum of detected values only. The * flag indicates one or more of the individual isotopes was non-detect.
Total uranium values in ug/l based on use of Minimum Detectable Activity (MDA) values for non-detect results.
MCL = Maximum Contaminant Level for drinking water systems of 30 ug/l for total Uranium

Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL	
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232	
S-5 DIS	4/11/13	0.07	0.06	0.06	J+	0.10	0.07	0.06	J	0.01	0.03	0.05	UJ	0.17	*
S-5 TOT	4/11/13	0.05	0.06	0.06	UJ+	0.18	0.11	0.08	J	-0.01	0.03	0.07	U	0.18	*
S-8 DIS	4/4/13	0.00	0.07	0.15	UJ	0.99	0.39	0.10	J+	0.02	0.05	0.12	UJ	0.99	*
S-8 TOT	4/4/13	0.09	0.09	0.11	U	0.24	0.13	0.08	J+	0.00	0.03	0.08	U	0.24	*
S-10 DIS	4/4/13	0.05	0.11	0.21	U	0.10	0.12	0.16	UJ	0.01	0.05	0.12	UJ	ND	*
S-10 TOT	4/4/13	0.03	0.09	0.18	U	0.26	0.15	0.11	J	0.12	0.10	0.10	J	0.38	*
S-53 DIS	4/16/13	0.03	0.05	0.09	U	0.22	0.12	0.07	J+	0.11	0.08	0.07	J	0.33	*
S-53 TOT	4/16/13	20.0	4.35	0.12	J	19.6	4.55	0.13	J+	19.1	4.11	0.18	J	58.6	
S-61 DIS	4/5/13	0.01	0.03	0.05	U	0.09	0.07	0.06	J+	0.03	0.04	0.08	U	0.09	*
S-61 TOT	4/5/13	0.08	0.07	0.07	J	0.31	0.14	0.06	J+	0.02	0.04	0.06	U	0.39	*
S-82 DIS	4/9/13	0.00	0.03	0.08	UJ	0.08	0.07	0.06	J	0.00	0.02	0.06	UJ	0.08	*
S-82 TOT	4/9/13	0.12	0.10	0.12	J	0.24	0.13	0.07	J	0.11	0.09	0.10	J	0.47	
S-84 DIS	4/11/13	-0.01	0.03	0.08	UJ+	0.17	0.10	0.08	J	0.00	0.04	0.08	U	0.17	*
S-84 TOT	4/11/13	0.12	0.10	0.13	UJ+	0.10	0.08	0.08	J	0.06	0.06	0.08	U	0.10	*
I-4 DIS	4/12/13	0.01	0.08	0.18	UJ+	0.21	0.14	0.12	J+	0.06	0.08	0.12	UJ	0.21	*
I-4 TOT	4/12/13	0.08	0.08	0.11	UJ+	0.29	0.14	0.10	J+	-0.01	0.03	0.09	U	0.29	*
I-9 DIS	4/9/13	-0.01	0.11	0.28	UJ	0.15	0.15	0.18	UJ	0.10	0.12	0.16	UJ	ND	*
I-9 FD DIS	4/9/13	0.06	0.08	0.13	UJ+	0.09	0.08	0.10	UJ+	0.01	0.03	0.09	U	ND	*
I-9 TOT	4/9/13	0.15	0.11	0.13	J	0.11	0.09	0.10	J	-0.02	0.03	0.10	U	0.26	*
I-9 FD TOT	4/9/13	0.05	0.06	0.08	UJ+	0.13	0.08	0.07	J+	0.03	0.04	0.07	UJ	0.13	*
I-11 DIS	4/4/13	0.04	0.07	0.13	U	0.49	0.20	0.07	J+	0.03	0.05	0.10	U	0.49	*
I-11 TOT	4/4/13	0.01	0.07	0.14	U	0.19	0.12	0.11	J+	0.02	0.04	0.07	U	0.19	*
I-62 DIS	4/4/13	0.01	0.05	0.13	UJ	0.21	0.15	0.13	J	0.02	0.05	0.10	UJ	0.21	*
I-62 FD DIS	4/4/13	0.01	0.03	0.07	U	0.10	0.08	0.09	J	-0.04	0.03	0.12	U	0.10	*
I-62 TOT	4/4/13	0.25	0.12	0.05	J	0.21	0.11	0.06	J	0.05	0.05	0.07	UJ	0.46	*
I-62 FD TOT	4/4/13	0.08	0.09	0.13	U	0.19	0.13	0.10	J	0.05	0.06	0.10	U	0.19	*
I-65 DIS	4/16/13	-0.03	0.03	0.12	UJ+	0.13	0.09	0.07	J+	0.01	0.03	0.07	UJ	0.13	*
I-65 FD DIS	4/16/13	0.01	0.03	0.06	UJ+	0.07	0.06	0.05	J+	0.02	0.04	0.07	UJ	0.07	*

Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL	
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232	
I-65 TOT	4/16/13	0.25	0.14	0.11	J+	0.09	0.08	0.10	UJ+	0.04	0.05	0.06	U	0.00	*
I-65 FD TOT	4/16/13	0.30	0.15	0.12	J+	0.17	0.11	0.09	J+	0.03	0.04	0.07	U	0.47	*
I-66 DIS	4/5/13	0.04	0.04	0.05	UJ	0.16	0.10	0.08	J+	0.04	0.05	0.08	UJ	0.16	*
I-66 TOT	4/5/13	0.04	0.06	0.11	U	0.12	0.10	0.07	J+	-0.01	0.04	0.09	U	0.12	*
I-67 DIS	4/5/13	0.02	0.04	0.07	U	0.13	0.09	0.07	J+	0.00	0.03	0.06	U	0.13	*
I-67 FD DIS	4/5/13	0.03	0.05	0.09	U	0.08	0.07	0.07	J	-0.01	0.03	0.07	U	0.08	*
I-67 TOT	4/5/13	0.05	0.07	0.09	U	0.61	0.23	0.08	J+	0.00	0.04	0.10	U	0.61	*
I-67 FD TOT	4/5/13	0.16	0.10	0.10	J	1.47	0.40	0.09	J	0.06	0.06	0.09	UJ	1.63	*
I-68 DIS	4/9/13	0.00	0.04	0.09	U	0.11	0.09	0.09	J	0.03	0.04	0.06	U	0.11	*
I-68 TOT	4/9/13	2.66	0.70	0.08		4.14	1.06	0.08		0.80	0.29	0.08		7.60	
I-73 DIS	4/12/13	0.02	0.04	0.08	U	0.13	0.09	0.06	J+	0.01	0.04	0.08	U	0.13	*
I-73 TOT	4/12/13	0.41	0.21	0.10	J	0.55	0.26	0.11	J+	0.45	0.22	0.09	J	1.41	
D-3 DIS	4/11/13	0.01	0.06	0.12	UJ+	0.17	0.10	0.08	J	0.05	0.06	0.08	UJ	0.17	*
D-3 TOT	4/11/13	0.07	0.08	0.11	UJ+	0.17	0.10	0.07	J	0.01	0.02	0.06	UJ	0.17	*
D-6 DIS	4/9/13	0.02	0.05	0.10	UJ+	0.07	0.06	0.08	U	0.02	0.04	0.08	UJ	ND	*
D-6 TOT	4/9/13	0.14	0.10	0.13	J+	0.13	0.08	0.07	J+	0.04	0.05	0.07	UJ	0.27	*
D-12 DIS	4/4/13	0.00	0.03	0.06	U	0.26	0.13	0.09	J+	0.00	0.03	0.07	U	0.26	*
D-12 FD DIS	4/4/13	0.01	0.03	0.06	U	0.15	0.10	0.09	J	0.00	0.04	0.09	U	0.15	*
D-12 TOT	4/4/13	0.11	0.13	0.16	UJ	0.34	0.25	0.23	J+	-0.02	0.08	0.20	UJ	0.34	*
D-12 FD TOT	4/4/13	0.10	0.12	0.16	U	0.17	0.14	0.11	J	0.07	0.09	0.12	UJ	0.17	*
D-13 DIS	4/4/13	-0.01	0.04	0.09	U	0.44	0.20	0.08	J+	0.00	0.04	0.08	U	0.44	*
D-13 TOT	4/4/13	0.39	0.16	0.06		0.37	0.16	0.08	J+	0.07	0.07	0.08	U	0.76	*
D-14 DIS	4/12/13	0.05	0.07	0.12	U	0.16	0.10	0.08	J+	0.00	0.03	0.06	U	0.16	*
D-14 TOT	4/12/13	0.99	0.29	0.12		1.15	0.33	0.05	J+	1.17	0.32	0.07		3.31	
D-81 DIS	4/3/13	0.29	0.23	0.22	J	0.10	0.13	0.15	UJ	-0.01	0.07	0.17	UJ	0.00	*
D-81 TOT	4/3/13	0.04	0.09	0.16	UJ	0.13	0.11	0.11	J	0.03	0.06	0.12	UJ	0.13	*
D-83 DIS	4/9/13	0.03	0.07	0.13	UJ+	0.21	0.13	0.08	J+	-0.02	0.04	0.11	U	0.21	*
D-83 TOT	4/9/13	0.20	0.13	0.14	J+	0.47	0.20	0.10	J+	-0.01	0.03	0.10	UJ	0.67	*

Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL	
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232	
D-85 DIS	4/11/13	-0.01	0.05	0.14	UJ+	0.12	0.09	0.08	J	-0.01	0.03	0.08	U	0.12	*
D-85 TOT	4/11/13	3.15	0.70	0.10	J+	5.81	1.27	0.06		2.79	0.62	0.07		11.75	
D-87 DIS	4/9/13	0.07	0.07	0.08	UJ	0.11	0.08	0.08	J	0.01	0.04	0.08	UJ	0.11	*
D-87 TOT	4/9/13	0.22	0.13	0.09	J	0.40	0.18	0.09		0.06	0.06	0.07	U	0.62	*
D-93 DIS	4/9/13	0.05	0.06	0.09	UJ	0.16	0.09	0.05	J	0.03	0.04	0.06	UJ	0.16	*
D-93 TOT	4/9/13	0.16	0.11	0.13	J	0.09	0.08	0.09	J	0.01	0.04	0.09	U	0.25	*
LR-100 DIS	4/3/13	0.13	0.22	0.39	UJ	0.28	0.28	0.32	UJ	-0.02	0.12	0.37	UJ	ND	*
LR-100 TOT	4/3/13	-0.03	0.04	0.12	U	0.14	0.10	0.09	J	0.03	0.04	0.06	U	0.14	*
LR-103 DIS	4/3/13	0.35	0.31	0.34	J	0.54	0.37	0.24	J	0.02	0.10	0.28	UJ	0.89	*
LR-103 TOT	4/3/13	0.03	0.05	0.07	U	0.11	0.08	0.09	J	-0.04	0.03	0.13	U	0.11	*
LR-104 DIS	4/4/13	0.03	0.07	0.12	U	0.06	0.07	0.10	U	-0.01	0.03	0.11	U	ND	*
LR-104 TOT	4/4/13	0.08	0.08	0.09	U	0.16	0.10	0.08	J	0.05	0.06	0.07	U	0.16	*
LR-105 DIS	4/3/13	-0.01	0.08	0.18	UJ	0.10	0.13	0.15	UJ	-0.01	0.07	0.15	UJ	ND	*
LR-105 TOT	4/3/13	0.05	0.05	0.05	J	0.30	0.14	0.07	J	0.03	0.04	0.07	UJ	0.35	*
MW-103 DIS	4/5/13	-0.02	0.06	0.18	U	0.12	0.10	0.12	J	0.07	0.08	0.09	U	0.12	*
MW-103 TOT	4/5/13	1.38	0.38	0.09		1.22	0.36	0.06	J	1.19	0.34	0.06	J	3.79	
MW-104 DIS	4/5/13	0.01	0.03	0.05	UJ	0.18	0.10	0.05	J+	0.02	0.04	0.07	UJ	0.18	*
MW-104 TOT	4/5/13	0.21	0.11	0.05	J	0.34	0.15	0.08	J+	0.18	0.10	0.08	J	0.73	
MW-1204 DIS	4/12/13	0.06	0.07	0.11	UJ	0.14	0.09	0.06	J+	0.02	0.04	0.06	UJ	0.14	*
MW-1204 FD DIS	4/12/13	-0.01	0.04	0.11	UJ	0.11	0.08	0.07	J+	-0.01	0.03	0.07	UJ	0.11	*
MW-1204 TOT	4/12/13	0.08	0.07	0.09	UJ	0.12	0.08	0.08	J+	0.01	0.02	0.05	UJ	0.12	*
MW-1204 FD TOT	4/12/13	0.10	0.08	0.10	J	0.10	0.08	0.09	J+	0.01	0.03	0.06	UJ	0.20	*
PZ-100-KS DIS	4/16/13	0.02	0.04	0.09	U	0.08	0.07	0.06	J+	0.00	0.03	0.06	U	0.08	*
PZ-100-KS TOT	4/16/13	0.09	0.08	0.08	J	0.39	0.17	0.07	J+	0.03	0.05	0.09	U	0.48	*
PZ-100-SD DIS	4/5/13	0.00	0.03	0.08	UJ	0.07	0.06	0.06	J+	0.00	0.03	0.06	UJ	0.07	*
PZ-100-SD TOT	4/5/13	0.02	0.04	0.06	U	0.15	0.10	0.06	J+	0.04	0.05	0.06	U	0.15	*
PZ-100-SS DIS	4/5/13	-0.01	0.03	0.07	U	0.10	0.08	0.09	J+	-0.02	0.03	0.12	U	0.10	*
PZ-100-SS TOT	4/5/13	0.02	0.04	0.09	UJ	0.10	0.09	0.10	J+	0.02	0.06	0.12	UJ	0.10	*

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Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL	
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232	
PZ-101-SS DIS	4/12/13	0.01	0.05	0.11	U	0.15	0.10	0.08	J+	0.00	0.03	0.07	U	0.15	*
PZ-101-SS TOT	4/12/13	0.05	0.10	0.18	U	0.33	0.19	0.14	J+	0.08	0.09	0.13	U	0.33	*
PZ-102R-SS DIS	4/11/13	0.01	0.02	0.06	UJ+	0.06	0.05	0.06	J+	0.01	0.02	0.05	UJ	0.06	*
PZ-102R-SS TOT	4/11/13	0.25	0.13	0.06	J+	0.27	0.13	0.08	J+	0.36	0.15	0.07		0.88	
PZ-102-SS DIS	4/11/13	0.10	0.07	0.07	J+	0.12	0.08	0.06	J+	0.03	0.04	0.07	UJ	0.22	*
PZ-102-SS TOT	4/11/13	3.24	0.78	0.13	J+	3.03	0.77	0.09	J+	4.35	0.98	0.09		10.62	
PZ-103-SS DIS	4/8/13	0.06	0.06	0.10	UJ	0.09	0.07	0.08	J	0.00	0.02	0.07	UJ	0.09	*
PZ-103-SS TOT	4/8/13	2.96	0.70	0.09	J	6.03	1.38	0.09	J	2.47	0.59	0.09	J	11.46	
PZ-104-KS DIS	4/11/13	0.04	0.05	0.08	UJ+	0.17	0.10	0.07	J	-0.01	0.02	0.07	UJ	0.17	*
PZ-104-KS TOT	4/11/13	0.10	0.07	0.06	J+	0.18	0.10	0.07	J	0.08	0.07	0.09	UJ	0.28	*
PZ-104-SD DIS	4/11/13	0.02	0.04	0.07	UJ+	0.16	0.10	0.07	J+	0.00	0.03	0.07	U	0.16	*
PZ-104-SD TOT	4/11/13	0.05	0.06	0.07	UJ+	0.17	0.11	0.08	J+	0.02	0.04	0.10	U	0.17	*
PZ-104-SS DIS	4/11/13	0.03	0.06	0.12	UJ+	0.08	0.07	0.09	U	-0.02	0.03	0.08	UJ	ND	*
PZ-104-SS FD DIS	4/11/13	0.01	0.06	0.14	UJ+	0.22	0.12	0.08	J+	-0.01	0.03	0.07	UJ	0.22	*
PZ-104-SS FD TOT	4/11/13	0.10	0.08	0.07	J+	0.07	0.06	0.06	J+	0.00	0.02	0.06	UJ	0.17	*
PZ-104-SS TOT	4/11/13	0.05	0.05	0.06	UJ+	0.16	0.10	0.08	J+	-0.03	0.03	0.10	U	0.16	*
PZ-105-SS DIS	4/4/13	0.01	0.05	0.12	U	0.24	0.13	0.08	J	0.03	0.05	0.08	U	0.24	*
PZ-105-SS TOT	4/4/13	0.04	0.06	0.10	U	0.08	0.07	0.08	J	0.01	0.02	0.06	UJ	0.08	*
PZ-106-KS DIS	4/15/13	0.04	0.05	0.08	U	0.16	0.10	0.06	J+	0.01	0.04	0.09	U	0.16	*
PZ-106-KS TOT	4/15/13	-0.01	0.04	0.12	U	0.09	0.08	0.09	J+	0.04	0.05	0.07	U	0.09	*
PZ-106-SD DIS	4/9/13	0.00	0.06	0.14	UJ	0.34	0.16	0.10	J	-0.01	0.03	0.10	UJ	0.34	*
PZ-106-SD TOT	4/9/13	0.21	0.12	0.10	J	0.13	0.09	0.08	J	0.14	0.09	0.09	J	0.48	
PZ-106-SS DIS	4/9/13	0.01	0.05	0.12	U	0.15	0.10	0.09	J	0.01	0.04	0.09	U	0.15	*
PZ-106-SS TOT	4/9/13	0.04	0.06	0.10	UJ	0.16	0.10	0.08	J	0.02	0.04	0.07	UJ	0.16	*
PZ-107-SS DIS	4/12/13	0.00	0.03	0.08	U	0.11	0.08	0.06	J+	0.00	0.03	0.06	U	0.11	*
PZ-107-SS TOT	4/12/13	1.01	0.29	0.08		0.78	0.25	0.09	J+	1.11	0.31	0.12		2.90	
PZ-109-SS DIS	4/11/13	0.01	0.02	0.05	UJ+	0.10	0.07	0.05	J	0.00	0.02	0.05	UJ	0.10	*
PZ-109-SS TOT	4/11/13	0.01	0.03	0.06	UJ+	0.17	0.10	0.06	J	0.01	0.04	0.08	UJ	0.17	*

Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL	
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232	
PZ-110-SS DIS	4/4/13	0.00	0.05	0.10	UJ	0.21	0.15	0.14	J+	0.08	0.09	0.11	UJ	0.21	*
PZ-110-SS TOT	4/4/13	0.03	0.04	0.07	U	0.16	0.11	0.09	J	0.02	0.04	0.08	U	0.16	*
PZ-111-KS DIS	4/9/13	-0.01	0.06	0.14	UJ+	0.14	0.10	0.08	J+	0.01	0.03	0.08	U	0.14	*
PZ-111-KS TOT	4/9/13	0.11	0.08	0.09	J+	0.20	0.10	0.05	J+	0.13	0.08	0.06	J	0.44	
PZ-111-SD DIS	4/4/13	0.01	0.05	0.13	UJ	0.45	0.24	0.13	J+	0.00	0.05	0.10	UJ	0.45	*
PZ-111-SD TOT	4/4/13	0.05	0.06	0.07	U	0.13	0.10	0.08	J+	0.00	0.05	0.10	U	0.13	*
PZ-112-AS DIS	4/12/13	0.01	0.08	0.17	U	0.20	0.13	0.10	J+	0.03	0.06	0.12	U	0.20	*
PZ-112-AS TOT	4/12/13	0.11	0.11	0.16	U	0.19	0.12	0.10	J+	0.05	0.07	0.10	U	0.19	*
PZ-113-AD DIS	4/11/13	0.04	0.05	0.07	UJ+	0.12	0.08	0.07	J	0.01	0.03	0.05	UJ	0.12	*
PZ-113-AD TOT	4/11/13	0.12	0.09	0.09	J+	0.14	0.10	0.09	J	0.06	0.06	0.06	J	0.32	
PZ-113-AS DIS	4/12/13	0.01	0.04	0.07	UJ	0.16	0.09	0.05	J+	0.02	0.03	0.05	UJ	0.16	*
PZ-113-AS TOT	4/12/13	0.10	0.08	0.07	J	0.23	0.12	0.06	J+	0.04	0.05	0.08	UJ	0.33	*
PZ-113-SS DIS	4/12/13	0.09	0.08	0.08	J	0.18	0.11	0.06	J+	0.03	0.05	0.08	U	0.27	*
PZ-113-SS TOT	4/12/13	1.09	0.32	0.10		2.37	0.59	0.08	J+	0.87	0.27	0.06		4.33	
PZ-114-AS DIS	4/8/13	-0.05	0.04	0.15	U	0.07	0.07	0.10	U	0.01	0.04	0.10	U	ND	*
PZ-114-AS TOT	4/8/13	0.03	0.06	0.11	UJ	0.13	0.08	0.07	J	0.02	0.03	0.06	UJ	0.13	*
PZ-115-SS DIS	4/5/13	0.04	0.06	0.09	U	0.21	0.12	0.06	J+	0.07	0.06	0.07	J	0.28	*
PZ-115-SS TOT	4/5/13	0.02	0.04	0.07	U	0.01	0.04	0.08	UJ+	-0.01	0.04	0.11	U	ND	*
PZ-116-SS DIS	4/12/13	0.03	0.05	0.07	U	0.08	0.08	0.07	J+	0.02	0.05	0.10	U	0.08	*
PZ-116-SS TOT	4/12/13	0.03	0.04	0.06	U	0.15	0.10	0.08	J+	0.03	0.05	0.09	U	0.15	*
PZ-200-SS DIS	4/5/13	0.03	0.07	0.13	U	0.10	0.08	0.07	J	-0.01	0.03	0.08	U	0.10	*
PZ-200-SS TOT	4/5/13	0.00	0.06	0.15	U	0.14	0.10	0.11	J	0.01	0.04	0.10	U	0.14	*
PZ-201A-SS DIS	4/8/13	0.03	0.07	0.13	U	0.08	0.08	0.10	U	-0.01	0.03	0.11	U	ND	*
PZ-201A-SS TOT	4/8/13	0.04	0.08	0.14	U	0.10	0.08	0.08	J	0.02	0.04	0.08	UJ	0.10	*
PZ-202-SS DIS	4/12/13	0.10	0.09	0.11	U	0.13	0.09	0.08	J+	0.01	0.03	0.06	U	0.13	*
PZ-202-SS TOT	4/12/13	0.16	0.11	0.13	J	0.39	0.17	0.10	J+	0.10	0.09	0.09	J	0.65	
PZ-203-SS DIS	4/5/13	0.02	0.04	0.07	U	0.22	0.12	0.06	J+	0.04	0.05	0.07	U	0.22	*
PZ-203-SS TOT	4/5/13	0.02	0.03	0.05	UJ	0.09	0.07	0.07	J+	0.03	0.04	0.05	UJ	0.09	*

Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL	
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232	
PZ-204A-SS DIS	4/8/13	0.02	0.06	0.13	U	0.11	0.09	0.08	J	0.02	0.05	0.10	U	0.11	*
PZ-204A-SS TOT	4/8/13	0.37	0.19	0.17	J	0.39	0.19	0.12		0.12	0.11	0.12	J	0.88	
PZ-204-SS DIS	4/9/13	0.04	0.07	0.12	U	0.10	0.09	0.11	U	0.02	0.05	0.11	U	ND	*
PZ-204-SS TOT	4/9/13	0.22	0.11	0.06	J	0.22	0.11	0.07	J	0.08	0.07	0.09	UJ	0.44	*
PZ-205-AS DIS	4/8/13	-0.02	0.03	0.12	U	0.10	0.08	0.09	J	-0.01	0.03	0.08	U	0.10	*
PZ-205-AS TOT	4/8/13	0.31	0.15	0.11		0.36	0.17	0.09		0.10	0.08	0.09	J	0.77	
PZ-205-SS DIS	4/8/13	0.03	0.05	0.08	U	0.06	0.07	0.08	U	0.00	0.04	0.09	U	ND	*
PZ-205-SS TOT	4/8/13	-0.01	0.04	0.11	U	0.09	0.08	0.08	J	0.05	0.06	0.08	UJ	0.09	*
PZ-206-SS DIS	4/8/13	0.05	0.05	0.06	UJ	0.10	0.08	0.06	J	0.01	0.03	0.05	UJ	0.10	*
PZ-206-SS TOT	4/8/13	0.10	0.08	0.06	J	0.13	0.09	0.08	J	0.01	0.03	0.07	UJ	0.23	*
PZ-207-AS DIS	4/3/13	-0.01	0.06	0.13	UJ	0.15	0.14	0.13	J	0.02	0.06	0.13	UJ	0.15	*
PZ-207-AS TOT	4/3/13	0.12	0.09	0.09	J	0.13	0.09	0.08	J	0.01	0.03	0.07	U	0.25	*
PZ-208-SS DIS	4/12/13	0.07	0.10	0.18	U	0.27	0.16	0.11	J+	-0.01	0.04	0.13	U	0.27	*
PZ-208-SS TOT	4/12/13	0.34	0.15	0.13	J	0.36	0.15	0.08	J+	0.36	0.15	0.09	J	1.06	
PZ-302-AI DIS	4/3/13	0.08	0.11	0.17	UJ	0.26	0.18	0.18	J	0.00	0.05	0.10	UJ	0.26	*
PZ-302-AI TOT	4/3/13	-0.04	0.06	0.20	UJ	0.25	0.17	0.13	J	0.06	0.08	0.11	UJ	0.25	*
PZ-303-AS DIS	4/4/13	-0.01	0.12	0.35	UJ	0.19	0.22	0.25	UJ+	-0.04	0.11	0.30	UJ	ND	*
PZ-303-AS TOT	4/4/13	1.03	0.50	0.21	J	1.70	0.72	0.26	J+	0.69	0.41	0.37	J	3.42	
PZ-304-AI DIS	4/4/13	-0.03	0.05	0.14	U	0.16	0.10	0.11	J+	0.00	0.03	0.08	U	0.16	*
PZ-304-AI TOT	4/4/13	0.01	0.07	0.16	U	0.41	0.19	0.08	J+	0.01	0.03	0.08	U	0.41	*
PZ-304-AS DIS	4/4/13	0.00	0.05	0.11	U	0.29	0.19	0.11	J+	0.02	0.05	0.11	U	0.29	*
PZ-304-AS TOT	4/4/13	0.04	0.06	0.11	U	0.17	0.12	0.10	J+	0.03	0.05	0.08	U	0.17	*
PZ-305-AI DIS	4/5/13	0.01	0.05	0.11	U	0.13	0.10	0.10	J	0.06	0.06	0.08	U	0.13	*
PZ-305-AI FD DIS	4/5/13	-0.01	0.04	0.09	U	0.05	0.06	0.09	U	0.05	0.06	0.08	U	ND	*
PZ-305-AI TOT	4/5/13	0.24	0.14	0.13	J	0.26	0.14	0.11	J	0.19	0.11	0.08	J	0.69	
PZ-305-AI FD TOT	4/5/13	0.29	0.14	0.08		0.33	0.15	0.07		0.28	0.14	0.08		0.90	

Table 5: Summary of Thorium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232				TOTAL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q	THORIUM-228 + 230 + 232

Notes:

All values are in units of picoCuries per liter (pCi/l)

DIS = dissolved sample (field filtered sample); TOT = total sample (unfiltered sample)

CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity

FD - Field duplicate sample

Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value;

UJ = Non-Detect at the estimated reported value; UJ+ = Non-Detect at the estimated reported value which may be biased high;

UJ- = Non-Detect at the estimated reported value which may be biased low;

J = estimated result; J+ = estimated result which may be biased high; J- = estimated result which may be biased low

Total Thorium - 228 + 230 +232 based on sum of detected values. ND indicates that results for all Thorium isotopes were non-detect and a * flag indicates that only one or two of the isotopes were detected.

Table 6: Summary of Radium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill OU-1

Sample ID	Sample Date	Radium-226				Radium-228				Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q			
S-5 DIS	4/11/13	0.04	0.07	0.11	U	0.45	0.43	0.83	UJ+	Non-Detect		Less Than MCL
S-5 TOT	4/11/13	1.10	0.57	0.26	J	5.03	1.81	2.44	J+	6.13		Exceeds MCL
S-8 DIS	4/4/13	0.45	0.23	0.12	J	1.00	0.49	0.81	J+	1.45		Less Than MCL
S-8 TOT	4/4/13	0.45	0.24	0.15	J	1.18	0.50	0.77	J+	1.63		Less Than MCL
S-10 DIS	4/4/13	0.01	0.04	0.09	UJ	0.37	0.37	0.73	U	Non-Detect		Less Than MCL
S-10 TOT	4/4/13	0.03	0.05	0.10	U	0.06	0.51	1.09	UJ	Non-Detect		Less Than MCL
S-53 DIS	4/16/13	0.84	0.37	0.14		1.46	0.70	1.15	J+	2.30		Less Than MCL
S-53 TOT	4/16/13	0.14	0.31	0.62	UJ	-2.53	4.74	10.29	UJ+	Non-Detect		Less Than MCL
S-61 DIS	4/5/13	0.37	0.20	0.14	J	0.89	0.54	0.98	UJ	0.37	*	Less Than MCL
S-61 TOT	4/5/13	1.93	0.59	0.18	J	1.21	0.51	0.77		3.14		Less Than MCL
S-82 DIS	4/9/13	0.64	0.31	0.16		1.17	0.62	1.06	J	1.81		Less Than MCL
S-82 TOT	4/9/13	1.63	0.55	0.17		2.04	0.74	1.01		3.67		Less Than MCL
S-84 DIS	4/11/13	0.11	0.12	0.17	U	0.63	0.57	1.11	UJ+	Non-Detect		Less Than MCL
S-84 TOT	4/11/13	0.24	0.19	0.23	J	1.92	0.68	0.93	J+	2.16		Less Than MCL
I-4 DIS	4/12/13	0.11	0.11	0.14	U	0.43	0.39	0.75	UJ+	Non-Detect		Less Than MCL
I-4 TOT	4/12/13	0.65	0.30	0.18		1.15	0.52	0.83	J+	1.80		Less Than MCL
I-9 DIS	4/9/13	0.67	0.33	0.20		1.49	0.69	1.12	J	2.16		Less Than MCL
I-9 FD DIS	4/9/13	0.85	0.38	0.23		1.79	0.81	1.31	J+	2.64		Less Than MCL
I-9 TOT	4/9/13	1.48	0.53	0.20		3.81	1.16	1.30	J	5.29		Exceeds MCL
I-9 FD TOT	4/9/13	1.27	0.51	0.24		2.45	0.85	1.12	J+	3.72		Less Than MCL
I-11 DIS	4/4/13	1.24	0.49	0.23		0.88	0.64	1.21	UJ+	1.24	*	Less Than MCL
I-11 TOT	4/4/13	1.02	0.42	0.24	J	2.37	0.83	1.08	J+	3.39		Less Than MCL
I-62 DIS	4/4/13	0.40	0.22	0.14	J	1.01	0.69	1.28	U	0.40	*	Less Than MCL
I-62 FD DIS	4/4/13	0.19	0.14	0.11	J	0.65	0.47	0.89	UJ	0.19	*	Less Than MCL
I-62 TOT	4/4/13	0.46	0.24	0.18	J	1.27	0.68	1.18	J	1.73		Less Than MCL
I-62 FD TOT	4/4/13	0.32	0.18	0.12	J	0.89	0.47	0.81	J	1.21		Less Than MCL
I-65 DIS	4/16/13	0.30	0.18	0.13	J	0.81	0.49	0.88	UJ+	0.30	*	Less Than MCL
I-65 FD DIS	4/16/13	0.25	0.18	0.16	J	0.85	0.52	0.94	UJ+	0.25	*	Less Than MCL
I-65 TOT	4/16/13	0.54	0.25	0.11		0.61	0.43	0.81	UJ+	0.54	*	Less Than MCL
I-65 FD TOT	4/16/13	0.47	0.23	0.15		0.91	0.50	0.88	J+	1.38		Less Than MCL

Table 6: Summary of Radium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill OU-1

Sample ID	Sample Date	Radium-226				Radium-228				Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q			
I-66 DIS	4/5/13	0.20	0.15	0.14	J	1.42	0.63	0.98		1.62		Less Than MCL
I-66 TOT	4/5/13	0.23	0.16	0.13	J	0.27	0.64	1.33	UJ	0.23	*	Less Than MCL
I-67 DIS	4/5/13	0.46	0.23	0.10		0.60	0.47	0.89	U	0.46	*	Less Than MCL
I-67 FD DIS	4/5/13	0.21	0.15	0.14	J	0.90	0.71	1.36	UJ	0.21	*	Less Than MCL
I-67 TOT	4/5/13	0.69	0.30	0.15	J	0.55	0.51	0.99	UJ	0.69	*	Less Than MCL
I-67 FD TOT	4/5/13	0.73	0.30	0.17		0.73	0.79	1.56	UJ	0.73	*	Less Than MCL
I-68 DIS	4/9/13	0.67	0.31	0.14		1.37	0.61	0.97		2.04		Less Than MCL
I-68 TOT	4/9/13	3.34	1.05	0.35	J	1.97	0.78	1.16	J	5.31		Exceeds MCL
I-73 DIS	4/12/13	1.04	0.41	0.17		1.03	0.57	1.01	J+	2.07		Less Than MCL
I-73 TOT	4/12/13	1.79	0.62	0.18	J	2.55	0.90	1.24	J+	4.34		Less Than MCL
D-3 DIS	4/11/13	2.12	0.74	0.33		2.72	0.79	0.79	J+	4.84		Less Than MCL
D-3 TOT	4/11/13	2.82	0.93	0.24	J	4.38	1.18	0.98	J+	7.20		Exceeds MCL
D-6 DIS	4/9/13	1.75	0.60	0.24		2.70	0.86	1.01	J+	4.45		Less Than MCL
D-6 TOT	4/9/13	1.91	0.64	0.21		5.89	1.70	1.66	J+	7.80		Exceeds MCL
D-12 DIS	4/4/13	0.19	0.18	0.24	U	1.37	0.57	0.86	J+	1.37	*	Less Than MCL
D-12 FD DIS	4/4/13	0.12	0.11	0.13	U	0.85	0.54	0.97	U	Non-Detect		Less Than MCL
D-12 TOT	4/4/13	0.96	0.40	0.17	J	0.56	0.52	1.01	UJ+	0.96	*	Less Than MCL
D-12 FD TOT	4/4/13	0.45	0.23	0.17	J	1.61	0.60	0.85	J	2.06		Less Than MCL
D-13 DIS	4/4/13	0.92	0.36	0.13		1.22	0.54	0.87	J+	2.14		Less Than MCL
D-13 TOT	4/4/13	1.20	0.44	0.19	J	2.52	0.82	1.01	J+	3.72		Less Than MCL
D-14 DIS	4/12/13	0.79	0.34	0.22		1.39	0.55	0.80	J+	2.18		Less Than MCL
D-14 TOT	4/12/13	1.97	0.62	0.17		1.74	0.68	1.00	J+	3.71		Less Than MCL
D-81 DIS	4/3/13	0.18	0.16	0.21	U	0.86	0.52	0.93	U	Non-Detect		Less Than MCL
D-81 TOT	4/3/13	0.87	0.39	0.22		1.59	0.65	0.98		2.46		Less Than MCL
D-83 DIS	4/9/13	1.79	0.62	0.16		3.78	1.13	1.20	J+	5.57		Exceeds MCL
D-83 TOT	4/9/13	3.17	0.99	0.32		5.53	1.42	0.89	J+	8.70		Exceeds MCL
D-85 DIS	4/11/13	0.91	0.40	0.19		1.26	0.57	0.93	J+	2.17		Less Than MCL
D-85 TOT	4/11/13	9.67	2.63	0.50	J	6.41	1.77	1.57	J+	16.08		Exceeds MCL
D-87 DIS	4/9/13	0.75	0.35	0.22		0.95	0.53	0.93	J	1.70		Less Than MCL
D-87 TOT	4/9/13	1.33	0.50	0.21		2.99	0.90	0.94		4.32		Less Than MCL

Table 6: Summary of Radium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill OU-1

Sample ID	Sample Date	Radium-226				Radium-228				Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q			
D-93 DIS	4/9/13	1.93	0.63	0.21		2.89	0.88	0.97		4.82		Less Than MCL
D-93 TOT	4/9/13	3.02	0.95	0.31		4.79	1.31	1.12	J	7.81		Exceeds MCL
LR-100 DIS	4/3/13	0.14	0.15	0.22	U	0.68	0.51	0.96	U	Non-Detect		Less Than MCL
LR-100 TOT	4/3/13	0.44	0.26	0.24	J	0.37	0.55	1.12	UJ	0.44	*	Less Than MCL
LR-103 DIS	4/3/13	0.52	0.28	0.16	J	1.62	0.78	1.29	J	2.14		Less Than MCL
LR-103 TOT	4/3/13	0.97	0.40	0.14		0.59	0.65	1.29	U	0.97	*	Less Than MCL
LR-104 DIS	4/4/13	0.39	0.19	0.10		1.00	0.52	0.88	J	1.39		Less Than MCL
LR-104 TOT	4/4/13	0.63	0.28	0.12		1.58	0.58	0.80	J	2.21		Less Than MCL
LR-105 DIS	4/3/13	1.04	0.42	0.20		0.95	0.64	1.18	U	1.04	*	Less Than MCL
LR-105 TOT	4/3/13	0.69	0.33	0.21		0.55	0.53	1.04	U	0.69	*	Less Than MCL
MW-103 DIS	4/5/13	0.24	0.15	0.09	J	1.08	0.62	1.09	U	0.24	*	Less Than MCL
MW-103 TOT	4/5/13	0.78	0.30	0.12		0.88	0.53	0.96	U	0.78	*	Less Than MCL
MW-104 DIS	4/5/13	0.25	0.17	0.14	J	1.34	0.61	0.99	J	1.59		Less Than MCL
MW-104 TOT	4/5/13	0.37	0.22	0.15	J	1.33	0.59	0.95	J	1.70		Less Than MCL
MW-1204 DIS	4/12/13	2.90	0.83	0.15		1.96	0.73	1.05	J+	4.86		Less Than MCL
MW-1204 FD DIS	4/12/13	2.31	0.77	0.21		2.47	0.79	0.95	J+	4.78		Less Than MCL
MW-1204 TOT	4/12/13	3.34	1.08	0.25	J	2.93	1.33	2.13	J+	6.27		Exceeds MCL
MW-1204 FD TOT	4/12/13	4.11	1.19	0.21	J	1.80	0.76	1.20	J+	5.91		Exceeds MCL
PZ-100-KS DIS	4/16/13	0.26	0.17	0.14	J	0.96	0.43	0.69	J+	1.22		Less Than MCL
PZ-100-KS TOT	4/16/13	0.16	0.14	0.12	J	0.84	0.57	1.05	UJ+	0.16	*	Less Than MCL
PZ-100-SD DIS	4/5/13	2.41	0.69	0.17		0.40	0.45	0.91	U	2.41	*	Less Than MCL
PZ-100-SD TOT	4/5/13	2.40	0.70	0.12	J	1.20	0.58	0.96	J	3.60		Less Than MCL
PZ-100-SS DIS	4/5/13	3.80	1.00	0.12		1.08	0.59	1.04	J	4.88		Less Than MCL
PZ-100-SS TOT	4/5/13	4.60	1.21	0.12	J	1.37	0.66	1.10	J	5.97		Exceeds MCL
PZ-101-SS DIS	4/12/13	23.28	5.24	0.12		2.49	0.81	1.00	J+	25.77		Exceeds MCL
PZ-101-SS TOT	4/12/13	21.89	4.97	0.25	J	2.12	0.71	0.89	J+	24.01		Exceeds MCL
PZ-102R-SS DIS	4/11/13	1.88	0.58	0.13		1.50	1.01	1.87	UJ+	1.88	*	Less Than MCL
PZ-102R-SS TOT	4/11/13	3.18	1.29	0.57	J	0.40	2.08	4.41	UJ+	3.18	*	Less Than MCL
PZ-102-SS DIS	4/11/13	4.58	1.18	0.13		2.35	0.81	1.04	J+	6.93		Exceeds MCL
PZ-102-SS TOT	4/11/13	8.05	1.95	0.18	J	7.98	2.42	2.67	J+	16.03		Exceeds MCL

Table 6: Summary of Radium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill OU-1

Sample ID	Sample Date	Radium-226				Radium-228				Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q			
PZ-103-SS DIS	4/8/13	3.89	1.08	0.18	J	1.53	0.63	0.95	J	5.42		Exceeds MCL
PZ-103-SS TOT	4/8/13	16.68	3.93	0.25	J	5.28	1.41	1.01	J	21.96		Exceeds MCL
PZ-104-KS DIS	4/11/13	0.07	0.10	0.15	U	0.73	0.47	0.86	UJ+	Non-Detect		Less Than MCL
PZ-104-KS TOT	4/11/13	0.32	0.19	0.13	J	0.18	0.43	0.90	UJ+	0.32	*	Less Than MCL
PZ-104-SD DIS	4/11/13	3.76	1.01	0.14		1.90	0.66	0.85	J+	5.66		Exceeds MCL
PZ-104-SD TOT	4/11/13	5.72	1.50	0.16	J	2.72	1.19	1.88	J+	8.44		Exceeds MCL
PZ-104-SS DIS	4/11/13	0.81	0.32	0.14		1.58	0.72	1.17	J+	2.39		Less Than MCL
PZ-104-SS FD DIS	4/11/13	1.10	0.40	0.13		1.03	0.50	0.82	J+	2.13		Less Than MCL
PZ-104-SS TOT	4/11/13	1.19	0.41	0.14		0.80	0.50	0.90	UJ+	1.19	*	Less Than MCL
PZ-104-SS FD TOT	4/11/13	1.53	0.50	0.12		0.86	0.44	0.75	J+	2.39		Less Than MCL
PZ-105-SS DIS	4/4/13	1.22	0.42	0.17		1.03	0.48	0.77	J	2.25		Less Than MCL
PZ-105-SS TOT	4/4/13	1.79	0.55	0.14		0.87	0.50	0.88	UJ	1.79	*	Less Than MCL
PZ-106-KS DIS	4/15/13	0.32	0.20	0.15	J	0.43	0.44	0.87	UJ+	0.32	*	Less Than MCL
PZ-106-KS TOT	4/15/13	0.38	0.22	0.16	J	0.31	0.44	0.89	UJ+	0.38	*	Less Than MCL
PZ-106-SD DIS	4/9/13	0.61	0.27	0.14		0.89	0.56	1.02	U	0.61	*	Less Than MCL
PZ-106-SD TOT	4/9/13	1.04	0.38	0.16		0.34	0.55	1.14	U	1.04	*	Less Than MCL
PZ-106-SS DIS	4/9/13	3.12	0.87	0.13		0.51	0.58	1.16	UJ	3.12	*	Less Than MCL
PZ-106-SS TOT	4/9/13	2.80	0.80	0.12		0.71	0.56	1.07	U	2.80	*	Less Than MCL
PZ-107-SS DIS	4/12/13	5.80	1.46	0.11		1.88	0.65	0.84	J+	7.68		Exceeds MCL
PZ-107-SS TOT	4/12/13	7.72	1.99	0.17	J	3.36	1.27	1.81	J+	11.08		Exceeds MCL
PZ-109-SS DIS	4/11/13	2.29	0.67	0.16		0.60	0.44	0.84	UJ+	2.29	*	Less Than MCL
PZ-109-SS TOT	4/11/13	2.15	0.67	0.16	J	0.84	0.56	1.04	UJ+	2.15	*	Less Than MCL
PZ-110-SS DIS	4/4/13	3.76	1.05	0.15		1.70	0.78	1.24	J	5.46		Exceeds MCL
PZ-110-SS TOT	4/4/13	4.00	1.07	0.15		1.15	0.63	1.09	J+	5.15		Exceeds MCL
PZ-111-KS DIS	4/9/13	0.31	0.18	0.13	J	0.73	0.51	0.94	UJ+	0.31	*	Less Than MCL
PZ-111-KS TOT	4/9/13	0.35	0.19	0.11	J	1.08	0.48	0.75	J+	1.43		Less Than MCL
PZ-111-SD DIS	4/4/13	1.17	0.41	0.12		0.93	0.49	0.82	J+	2.10		Less Than MCL
PZ-111-SD TOT	4/4/13	0.91	0.35	0.20	J	0.26	0.45	0.93	UJ+	0.91	*	Less Than MCL
PZ-112-AS DIS	4/12/13	0.74	0.35	0.16		1.05	0.50	0.82	J+	1.79		Less Than MCL
PZ-112-AS TOT	4/12/13	0.95	0.43	0.17		2.24	0.71	0.84	J+	3.19		Less Than MCL

Table 6: Summary of Radium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill OU-1

Sample ID	Sample Date	Radium-226				Radium-228				Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q			
PZ-113-AD DIS	4/11/13	1.59	0.56	0.20		2.83	0.83	0.84	J+	4.42		Less Than MCL
PZ-113-AD TOT	4/11/13	2.27	0.77	0.24	J	7.01	1.74	0.85	J+	9.28		Exceeds MCL
PZ-113-AS DIS	4/12/13	0.49	0.26	0.21	J	1.34	0.61	0.98	J+	1.83		Less Than MCL
PZ-113-AS TOT	4/12/13	0.61	0.29	0.14	J	2.36	0.77	0.94	J+	2.97		Less Than MCL
PZ-113-SS DIS	4/12/13	2.48	0.74	0.15		1.60	0.65	0.97	J+	4.08		Less Than MCL
PZ-113-SS TOT	4/12/13	4.92	1.27	0.17	J	2.04	0.84	1.28	J+	6.96		Exceeds MCL
PZ-114-AS DIS	4/8/13	0.18	0.16	0.19	UJ	0.17	0.49	1.02	UJ	Non-Detect		Less Than MCL
PZ-114-AS TOT	4/8/13	0.43	0.23	0.15	J	0.86	0.67	1.28	UJ	0.43	*	Less Than MCL
PZ-115-SS DIS	4/5/13	7.35	1.77	0.11		1.31	0.52	0.75		8.66		Exceeds MCL
PZ-115-SS TOT	4/5/13	7.70	1.87	0.13	J	0.85	0.51	0.92	U	7.70	*	Exceeds MCL
PZ-116-SS DIS	4/12/13	0.21	0.16	0.15	J	1.29	0.48	0.66	J+	1.50		Less Than MCL
PZ-116-SS TOT	4/12/13	0.83	0.34	0.15	J	0.76	0.45	0.81	UJ+	0.83	*	Less Than MCL
PZ-200-SS DIS	4/5/13	1.84	0.59	0.22		1.37	0.68	1.12		3.21		Less Than MCL
PZ-200-SS TOT	4/5/13	2.44	0.77	0.25	J	1.38	0.94	1.73	UJ	2.44	*	Less Than MCL
PZ-201A-SS DIS	4/8/13	0.32	0.18	0.13	J	0.93	0.54	0.96	UJ	0.32	*	Less Than MCL
PZ-201A-SS TOT	4/8/13	0.32	0.18	0.12	J	1.11	0.65	1.16	UJ	0.32	*	Less Than MCL
PZ-202-SS DIS	4/12/13	0.38	0.22	0.17	J	0.86	0.46	0.78	J+	1.24		Less Than MCL
PZ-202-SS TOT	4/12/13	0.85	0.35	0.15		0.69	0.47	0.86	UJ+	0.85	*	Less Than MCL
PZ-203-SS DIS	4/5/13	1.44	0.47	0.13		0.37	0.56	1.14	U	1.44	*	Less Than MCL
PZ-203-SS TOT	4/5/13	1.22	0.44	0.11	J	1.08	0.65	1.17	UJ	1.22	*	Less Than MCL
PZ-204A-SS DIS	4/8/13	0.67	0.30	0.14	J	0.46	0.47	0.94	UJ	0.67	*	Less Than MCL
PZ-204A-SS TOT	4/8/13	1.46	0.50	0.17	J	1.30	0.62	1.03	J	2.76		Less Than MCL
PZ-204-SS DIS	4/9/13	0.87	0.37	0.22		0.74	0.49	0.91	UJ	0.87	*	Less Than MCL
PZ-204-SS TOT	4/9/13	1.26	0.44	0.16		1.16	0.50	0.78		2.42		Less Than MCL
PZ-205-AS DIS	4/8/13	0.57	0.28	0.15	J	1.04	0.55	0.94	J	1.61		Less Than MCL
PZ-205-AS TOT	4/8/13	1.15	0.47	0.21	J	1.81	0.68	0.96	J	2.96		Less Than MCL
PZ-205-SS DIS	4/8/13	1.33	0.44	0.12	J	1.13	0.56	0.94	J	2.46		Less Than MCL
PZ-205-SS TOT	4/8/13	1.39	0.48	0.12	J	1.31	0.68	1.15	J	2.70		Less Than MCL
PZ-206-SS DIS	4/8/13	1.13	0.41	0.15	J	0.72	0.75	1.48	UJ	1.13	*	Less Than MCL
PZ-206-SS TOT	4/8/13	1.12	0.37	0.12	J	1.10	0.72	1.31	UJ	1.12	*	Less Than MCL

Table 6: Summary of Radium Isotope Results - April 2013 Groundwater Sampling, West Lake Landfill OU-1

Sample ID	Sample Date	Radium-226				Radium-228				Combined Radium 226 + 228		Combined Radium relative to 5 pCi/L MCL
		Result	CSU	MDA	FINAL Q	Result	CSU	MDA	FINAL Q			
PZ-207-AS DIS	4/3/13	0.49	0.25	0.11	J	1.16	0.64	1.11	J	1.65		Less Than MCL
PZ-207-AS TOT	4/3/13	1.12	0.46	0.19		0.68	0.75	1.49	UJ	1.12	*	Less Than MCL
PZ-208-SS DIS	4/12/13	1.06	0.39	0.15		1.19	0.56	0.91	J+	2.25		Less Than MCL
PZ-208-SS TOT	4/12/13	1.14	0.41	0.14	J	1.31	0.63	1.05	J+	2.45		Less Than MCL
PZ-302-AI DIS	4/3/13	0.39	0.22	0.16	J	0.86	0.56	1.02	U	0.39	*	Less Than MCL
PZ-302-AI TOT	4/3/13	0.60	0.27	0.13	J	1.20	0.53	0.84		1.80		Less Than MCL
PZ-303-AS DIS	4/4/13	0.44	0.23	0.14	J	0.78	0.60	1.14	UJ+	0.44	*	Less Than MCL
PZ-303-AS TOT	4/4/13	1.38	0.49	0.15	J	1.61	0.81	1.37	J+	2.99		Less Than MCL
PZ-304-AI DIS	4/4/13	0.62	0.31	0.24	J	1.23	0.53	0.81	J+	1.85		Less Than MCL
PZ-304-AI TOT	4/4/13	1.23	0.51	0.24	J	1.96	0.64	0.77	J+	3.19		Less Than MCL
PZ-304-AS DIS	4/4/13	0.47	0.27	0.19	J	0.96	0.45	0.72	J+	1.43		Less Than MCL
PZ-304-AS TOT	4/4/13	1.34	0.52	0.22	J	1.76	0.66	0.94	J+	3.10		Less Than MCL
PZ-305-AI DIS	4/5/13	0.27	0.17	0.11	J	0.72	0.78	1.54	UJ	0.27	*	Less Than MCL
PZ-305-AI FD DIS	4/5/13	0.27	0.17	0.11	J	0.53	0.75	1.53	UJ	0.27	*	Less Than MCL
PZ-305-AI TOT	4/5/13	1.13	0.44	0.16		3.02	0.95	1.10	J	4.15		Less Than MCL
PZ-305-AI FD TOT	4/5/13	0.79	0.33	0.11		1.98	0.84	1.31	J	2.77		Less Than MCL

Notes:

All values are in units of picoCuries per liter (pCi/l)

DIS = dissolved (filtered) sample; TOT = total (unfiltered) sample

CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity

Data Validation Qualifiers (Final Q) include: U = Non-detect at the reported value, UJ = Non-Detect at the estimated reported value, UJ+ = Non-Detect at the estimated reported value which may be biased high, J = estimated result; J+ = estimated result which may be biased high

Combined Radium-226 plus Radium-228 = the sum of the Ra-226 and Ra-228 results unless one of results was non-detect, in which case is only the detected result shown and the value is flagged with a *.

Non-Detect = neither Radium-226 nor Radium-228 were detected in the sample

MCL = Maximum Contaminant Level for drinking water systems of 5 pCi/l for total Radium-226 plus Radium-228

FB - Field blank

FD - Field duplicate sample

Table 7: Comparision of Radium Results for Field Duplicate Samples

Sample ID	Sample Date	Radium-226						Radium-228					
		Result	CSU	MDA	FINAL Q	Ra-226 = Detect?	Relative Percent Difference (%)	Result	CSU	MDA	FINAL Q	Ra228 = Detect?	Relative Percent Difference (%)
I-62 DIS	4/4/13	0.40	0.22	0.14	J	Detect	71.2	1.01	0.69	1.28	U	Non-Detect	Non-Detect
I-62 FD DIS	4/4/13	0.19	0.14	0.11	J	Detect		0.65	0.47	0.89	UJ	Non-Detect	
I-62 TOT	4/4/13	0.46	0.24	0.18	J	Detect	35.9	1.27	0.68	1.18	J	Detect	35.2
I-62 FD TOT	4/4/13	0.32	0.18	0.12	J	Detect		0.89	0.47	0.81	J	Detect	
I-65 DIS	4/16/13	0.30	0.18	0.13	J	Detect	18.2	0.81	0.49	0.88	UJ+	Non-Detect	Non-Detect
I-65 FD DIS	4/16/13	0.25	0.18	0.16	J	Detect		0.85	0.52	0.94	UJ+	Non-Detect	
I-65 TOT	4/16/13	0.54	0.25	0.11		Detect	13.9	0.61	0.43	0.81	UJ+	Non-Detect	Non-Detect
I-65 FD TOT	4/16/13	0.47	0.23	0.15		Detect		0.91	0.50	0.88	J+	Detect	
I-67 DIS	4/5/13	0.46	0.23	0.10		Detect	74.6	0.60	0.47	0.89	U	Non-Detect	Non-Detect
I-67 FD DIS	4/5/13	0.21	0.15	0.14	J	Detect		0.90	0.71	1.36	UJ	Non-Detect	
I-67 TOT	4/5/13	0.69	0.30	0.15	J	Detect	5.6	0.55	0.51	0.99	UJ	Non-Detect	Non-Detect
I-67 FD TOT	4/5/13	0.73	0.30	0.17		Detect		0.73	0.79	1.56	UJ	Non-Detect	
D-12 DIS	4/4/13	0.19	0.18	0.24	U	Non-Detect	Non-Detect	1.37	0.57	0.86	J+	Detect	Non-Detect
D-12 FD DIS	4/4/13	0.12	0.11	0.13	U	Non-Detect		0.85	0.54	0.97	U	Non-Detect	
D-12 TOT	4/4/13	0.96	0.40	0.17	J	Detect	72.3	0.56	0.52	1.01	UJ+	Non-Detect	Non-Detect
D-12 FD TOT	4/4/13	0.45	0.23	0.17	J	Detect		1.61	0.60	0.85	J	Detect	
MW-1204 DIS	4/12/13	2.90	0.83	0.15		Detect	22.6	1.96	0.73	1.05	J+	Detect	23.0
MW-1204 FD	4/12/13	2.31	0.77	0.21		Detect		2.47	0.79	0.95	J+	Detect	
MW-1204 TOT	4/12/13	3.34	1.08	0.25	J	Detect	20.7	2.93	1.33	2.13	J+	Detect	47.8
MW-1204 FD	4/12/13	4.11	1.19	0.21	J	Detect		1.80	0.76	1.20	J+	Detect	
PZ-104-SS DIS	4/11/13	0.81	0.32	0.14		Detect	30.4	1.58	0.72	1.17	J+	Detect	42.1
PZ-104-SS FD	4/11/13	1.10	0.40	0.13		Detect		1.03	0.50	0.82	J+	Detect	
PZ-104-SS TOT	4/11/13	1.19	0.41	0.14		Detect	25.0	0.80	0.50	0.90	UJ+	Non-Detect	Non-Detect
PZ-104-SS FD	4/11/13	1.53	0.50	0.12		Detect		0.86	0.44	0.75	J+	Detect	
PZ-305-AI DIS	4/5/13	0.27	0.17	0.11	J	Detect	0.0	0.72	0.78	1.54	UJ	Non-Detect	Non-Detect
PZ-305-AI FD	4/5/13	0.27	0.17	0.11	J	Detect		0.53	0.75	1.53	UJ	Non-Detect	
PZ-305-AI TOT	4/5/13	1.13	0.44	0.16		Detect	35.4	3.02	0.95	1.10	J	Detect	41.6
PZ-305-AI FD	4/5/13	0.79	0.33	0.11		Detect		1.98	0.84	1.31	J	Detect	

Notes: All results are in units of pCi/L; FD = Field duplicate; CSU = Combined Standard Uncertainty (2-sigma); MDA = Minimum Detectable Activity
Data Validation Qualifiers (Final Q) include: J = estimated result, J+ = estimated result which may be biased high, UJ = Non-detect at the estimated reported value, and UJ+ = Non-Detect at the estimated reported value which may be biased high

Table 8: Summary of Detected Trace Metal Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
S-5	11-Apr-13	D	1000 U	50 U	10 U	470	50 U	250 U	18000	9 J	240	0.064 J	200 U	250 U	31 U
S-5	11-Apr-13	T	1000 U	50 U	12 J	450	50 U	250 U	19000	8.5 J	240	0.071 J	75 J	250 U	55 U
S-8	04-Apr-13	D	1000 U	50 U	13 U	380	50 U	250 U	480 J	50 U	1200	0.092	200 U	250 U	100 U
S-8	04-Apr-13	T	1000 U	50 U	50 U	400	50 U	250 U	1600	50 U	1200	0.086 J	200 U	250 U	100 U
S-10	04-Apr-13	D	830 J	50 U	63	200 J	50 U	250 U	130000	8.5 J	7800	0.1 J+	200 U	250 U	100 U
S-10	04-Apr-13	T	1000	50 U	54	180 J	50 U	250 U	130000	8.5 J	7300	0.11 J	200 U	250 U	100 U
S-53	11-Apr-13	T	62000	50 U	42 U	1400	98	46 J	100000	140	8900	0.2	180 J	160 J	680
S-53	12-Apr-13	D	1000 U	50 U	50 U	370	50 U	250 U	1500	50 U	6200	0.2 U	200 U	250 U	28 U
S-61	05-Apr-13	D	200 U	10 U	10 U	200	10 U	5.8 J	430	4.4 J	670	0.2 U	16 J	4.4 J	6.1 U
S-61	05-Apr-13	T	700 J	50 U	50 U	220 J	50 U	250 U	1500	280	670	0.2 U	200 U	250 U	100 U
S-82	09-Apr-13	D	1000 U	50 U	220	810	50 U	250 U	41000	9 J	1800	0.068 J	200 U	250 U	33 J
S-82	09-Apr-13	T	4300	50 U	230	1300	17 J	62 J	59000	110	2600	0.2 U	180 J	44 J	160
S-84	11-Apr-13	D	1000 U	50 U	130	730	50 U	250 U	62000	11 J	2000	0.2 U	200 U	250 U	100 U
S-84	11-Apr-13	T	2500	50 U	140	900	50 U	43 J	73000	18 J	2300	0.2 U	67 J	250 U	90 U
I-4	12-Apr-13	D	1000 U	50 U	50 U	400	50 U	250 U	25000	50 U	570	0.06 J	200 U	250 U	28 U
I-4	12-Apr-13	T	1000 U	50 U	12 U	410	50 U	250 U	26000	12 J	590	0.065 J	200 U	28 J	30 U
I-9	09-Apr-13	D	2000	50 U	30 J	1500	50 U	500	36000	9 J	1200	0.066 J	400	500	32 J
I-9	09-Apr-13	T	1000 U	50 U	26 U	1400	50 U	250 U	34000	50 U	1200	0.2 U	200 U	250 U	31 U
I-9 FD	09-Apr-13	D	2000	50 U	32 J	1500	50 U	500	37000	9.5 J	1300	0.064 J	400	500	69 J
I-9 FD	09-Apr-13	T	1000 U	50 U	24 U	1400	50 U	250 U	34000	50 U	1100	0.2 U	200 U	250 U	27 U
I-11	04-Apr-13	D	1000 U	50 U	21 U	850	50 U	250 U	34000	9.5 J	2200	0.2 U	200 U	250 U	30 U
I-11	04-Apr-13	T	1000 U	50 U	14 U	890	50 U	250 U	36000	50 U	2100	0.088 J	200 U	250 U	100 U
I-62	04-Apr-13	D	1000 U	50 U	14 U	360	50 U	250 U	6500	50 U	520	0.061	200 U	250 U	100 U
I-62	04-Apr-13	T	770 J	50 U	15 U	390	50 U	250 U	8900	50 U	540	0.2 U	200 U	250 U	32 J
I-62 FD	04-Apr-13	D	1000 U	50 U	16 U	350	16 J	250 U	6500	50 U	520	0.2 U	200 U	250 U	27 U
I-62 FD	04-Apr-13	T	1000 U	50 U	13 U	370	50 U	250 U	7900	50 U	520	0.2 U	200 U	250 U	100 U
I-65	16-Apr-13	D	200 U	10 U	10 U	190	10 U	50 U	100 U	1.6 J	14 J	0.2 U	40 U	50 U	5.7 U
I-65	16-Apr-13	T	1700	10 U	10 U	280	10 U	11 J	2500	8 J	750	0.2 U	24 J	50 U	25
I-65 FD	16-Apr-13	D	200 U	10 U	10 U	190	10 U	50 U	100 U	2.4 J	13 J	0.2 U	40 U	50 U	5.6 U
I-65 FD	16-Apr-13	T	2200	10 U	3 U	270	10 U	14 J	3100	10	850	0.2 U	27 J	50 U	29
I-66	05-Apr-13	D	200 U	10 U	4.8 U	140	10 U	7.3 J	2100	3.6 J	4700	0.2 U	14 J	50 U	7.1 U
I-66	05-Apr-13	T	500 J	50 U	50 U	170 J	50 U	250 U	4100	50 U	5000	0.2 U	200 U	250 U	100 U

Table 8: Summary of Detected Trace Metal Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
I-67	05-Apr-13	D	200 U	10 U	10 U	250	10 U	50 U	4400	2.4 J	1200	0.2 U	40 U	50 U	11 U
I-67	05-Apr-13	T	950 J	50 U	50 U	250	50 U	250 U	5100	50 U	1200	0.2 U	200 U	250 U	100 U
I-67 FD	05-Apr-13	D	200 U	10 U	2.7 U	250	10 U	50 U	4800	2.5 J	1200	0.2 U	40 U	50 U	20 U
I-67 FD	05-Apr-13	T	820 J	50 U	50 U	260	50 U	250 U	5100	50 U	1200	0.2 U	200 U	250 U	100 U
I-68	09-Apr-13	D	2000	50 U	50 U	620	50 U	500	460 J	8 J	1800	0.061 J	400	500	54 J
I-68	09-Apr-13	T	46000	50 U	19 U	1000	90	39 J	35000	140	2200	0.36	160 J	110 U	540
I-73	12-Apr-13	D	1000 U	50 U	63 J+	1100	50 U	26 J	47000	50 U	1700	0.076 J	100 J	20 U	380
I-73	12-Apr-13	T	3300	50 U	67	1200	16 J	26 J	57000	32 J	1800	0.09 J	110 J	23 J	2700
D-3	11-Apr-13	D	1000 U	50 U	50 U	2300	50 U	250 U	30000	50 U	500	0.074 J	200 U	27 J	28 U
D-3	11-Apr-13	T	1000 U	50 U	50 U	2300	50 U	250 U	31000	8.5 U	500	0.069 J	200 U	250 U	100 U
D-6	09-Apr-13	D	1000 U	50 U	50 U	1300	50 U	250 U	18000	50	600	0.066 J	200 U	250 U	29 J
D-6	09-Apr-13	T	740 J	50 U	50 U	1300	50 U	250 U	18000	50 U	610	0.2 U	200 U	250 U	31 U
D-12	04-Apr-13	D	1000	50	50	440	50 U	250 U	11000	50 U	1200	0.076	200 U	250 U	26 J
D-12	04-Apr-13	T	880 J	50	50 U	500	50 U	250 U	19000	50 U	1200	0.2 U	200 U	250 U	28 J
D-12 FD	04-Apr-13	D	1000 U	50 U	50 U	450	50 U	250 U	11000	50 U	1200	0.2 U	200 U	250 U	28 J
D-12 FD	04-Apr-13	T	490 J	50 U	50 U	470	50 U	250 U	15000	50 U	1200	0.079 U	200 U	250 U	100 U
D-13	04-Apr-13	D	1000 U	50 U	50 U	680	50 U	250 U	14000	50 U	430	0.11 J+	200 U	250 U	100 U
D-13	04-Apr-13	T	2600	50 U	50 U	800	16 J	250 U	31000	13 J	620	0.087 J	200 U	27 J	63 J
D-14	12-Apr-13	D	1000 U	50 U	50 U	530	50 U	250 U	11000	50 U	1600	0.068 J	200 U	250 U	28 U
D-14	12-Apr-13	T	4700	50 U	15 U	600	50 U	250 U	18000	14 J	1600	1.2	200 U	25 J	61 U
D-81	03-Apr-13	D	1000 U	50 U	11 U	390	50 U	250 U	18000	50 U	1100	0.2 U	200 U	250 U	30 J
D-81	03-Apr-13	T	1000 U	50 U	50 U	410	50 U	250 U	19000	50 U	1100	0.2 U	200 U	250 U	100 U
D-83	09-Apr-13	D	1000 U	50 U	50 U	1900	50 U	250 U	17000	50 U	390	0.2 U	200 U	250 U	32 J
D-83	09-Apr-13	T	1000 U	50 U	50 U	1800	50 U	250 U	15000	50 U	350	0.2 U	200 U	250 U	35 U
D-85	11-Apr-13	D	500 J	50 U	40 U	1900	50 U	250 U	57000	8.5 J	1100	0.2 U	200 U	23 J	28 U
D-85	11-Apr-13	T	33000	50 U	71	4100	59	57 J	180000	100	5200	0.14 J+	460	89 J	370
D-87	09-Apr-13	D	2000	50 U	50 U	1400	50 U	500	36000	50 U	670	0.069 J	400	59 J	30 J
D-87	09-Apr-13	T	740 J	50 U	50 U	1400	50 U	250 U	33000	10 J	620	0.2 U	200 U	250 U	31 U
D-93	09-Apr-13	D	2000	50 U	50 U	1400	50 U	500	22000	8 J	440	0.065 J	400	500	52 J
D-93	09-Apr-13	T	1100	50 U	50 U	1400	50 U	250 U	21000	9.5 J	450	0.2 U	200 U	250 U	31 U
LR-100	03-Apr-13	D	1000 U	50 U	50 U	430	50 U	250 U	20000	50 U	160	0.083	200 U	250 U	27 J
LR-100	03-Apr-13	T	1000 U	50 U	50 U	430	50 U	250 U	19000	8 J	140	0.08 J	200 U	250 U	31 J

Table 8: Summary of Detected Trace Metal Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
LR-103	03-Apr-13	D	1000 U	50 U	53	1200	50 U	250 U	40000	50 U	1200	0.2 U	200 U	250 U	100 U
LR-103	03-Apr-13	T	510 J	50 U	46 J	1200	50 U	250 U	40000	50 U	1100	0.11 J	200 U	22 J	27 J
LR-104	04-Apr-13	D	1000 U	50 U	50 U	390	50 U	250 U	14000	50 U	1200	0.066	200 U	250 U	29 U
LR-104	04-Apr-13	T	1000 U	50 U	50 U	400	50 U	250 U	14000	50 U	1100	0.2 U	200 U	27 J	100 U
LR-105	03-Apr-13	D	1000 U	50 U	50 U	820	17 J	250 U	13000	50 U	52 J	0.095	120 J	250 U	27 J
LR-105	03-Apr-13	T	900 J	50 U	50 U	820	50 U	250 U	14000	18 J	64 J	0.078 J	120 J	24 J	83 J
MW-103	05-Apr-13	D	200 U	4.2 U	2.9 U	200	10 U	50 U	210	1.7 J	510	0.2 U	13 J	6.9 U	9.9 U
MW-103	05-Apr-13	T	13000 J+	50 U	50 U	320	20 J	250 U	11000	22 J	620	0.2 U	200 U	26 J	75 J
MW-104	05-Apr-13	D	200 U	4 U	17	370	10 U	50 U	16000	4.1 J	3700	0.2 U	40 U	50 U	9.5 U
MW-104	05-Apr-13	T	6900	50 U	30 J	480	50 U	250 U	26000	27 J	3900	0.2 U	200 U	250 U	88 J
MW-1204	12-Apr-13	D	1000 U	50 U	50 U	340	50 U	250 U	4800	50 U	100	0.2 U	200 U	250 U	100 U
MW-1204	12-Apr-13	T	1000 U	50 U	50 U	300	50 U	250 U	4800	50 U	100	0.2 U	200 U	250 U	33 U
MW-1204 FD	12-Apr-13	D	1000 U	50 U	50 U	350	50 U	250 U	5000	50 U	98	0.2 U	200 U	250 U	100 U
MW-1204 FD	12-Apr-13	T	1000 U	50 U	50 U	300	50 U	250 U	4700	50 U	100	0.2 U	200 U	250 U	32 U
PZ-100-KS	16-Apr-13	D	200 U	10 U	10 U	4.4 J	10 U	50 U	32 J	1.5 J	21	0.2 U	40 U	50 U	8.1 U
PZ-100-KS	16-Apr-13	T	200 U	10 U	10 U	4.2 J	10 U	50 U	220	10 U	17	0.2 U	40 U	50 U	13 J
PZ-100-SD	05-Apr-13	D	200 U	10 U	2.3 U	320	10 U	50 U	1100	2.3 J	72	0.2 U	40 U	50 U	5.3 U
PZ-100-SD	05-Apr-13	T	1000 U	50 U	50 U	320	50 U	250 U	1600	50 U	70 J	0.2 U	200 U	250 U	100 U
PZ-100-SS	05-Apr-13	D	200 U	10 U	10 U	65	10 U	50 U	100 U	2 J	15 U	0.2 U	20 J	50 U	12 U
PZ-100-SS	05-Apr-13	T	1000 U	50 U	50 U	70 J	50 U	250 U	500 U	50 U	75 U	0.2 U	200 U	250 U	100 U
PZ-101-SS	12-Apr-13	D	1000 U	50 U	50 U	520	50 U	250 U	3000	50 U	57 J	0.073 J-	200 U	250 U	26 U
PZ-101-SS	12-Apr-13	T	2300	50 U	22 U	480	50 U	250 U	15000	9 J	130	0.067 J-	200 U	250 U	99 U
PZ-102R-SS	11-Apr-13	D	1000 U	50 U	50 U	82 J	50 U	250 U	220 J	50 U	75 U	0.2 U	200 U	250 U	60 U
PZ-102R-SS	11-Apr-13	T	3500	50 U	50 U	110 J	50 U	250 U	6700	9.5 U	36 J	0.11 J	200 U	250 U	120 J+
PZ-102-SS	11-Apr-13	D	1000 U	50 U	11 U	430	50 U	250 U	3500	50 U	260	0.2 U	200 U	250 U	28 U
PZ-102-SS	11-Apr-13	T	26000	50 U	19 U	690	33 J	250 U	34000	57	1000	0.14 J	80 J	65 J	170
PZ-103-SS	08-Apr-13	D	1000 U	50 U	50 U	580	50 U	250 U	19000	50 U	370	0.2 U	200 U	250 U	31 J
PZ-103-SS	08-Apr-13	T	8100	50 U	13 U	620	24 J	250 U	26000	14 J	430	0.2 U	200 U	35 U	110 J+
PZ-104-KS	11-Apr-13	D	1000 U	50 U	50 U	61 J	50 U	250 U	810	50 U	19 J	0.2 U	200 U	250 U	30 J
PZ-104-KS	11-Apr-13	T	790 J	50 U	50 U	63 J	50 U	250 U	1300	50 U	25 J	0.2 U	200 U	250 U	40 J
PZ-104-SD	11-Apr-13	D	1000 U	50 U	50 U	660	19 J	250 U	7900	50 U	160	0.067 J	200 U	250 U	26 U
PZ-104-SD	11-Apr-13	T	1000 U	50 U	20 U	1600	42 J	250 U	22000	50 U	180	0.2 U	200 U	34 J	100 U

Table 8: Summary of Detected Trace Metal Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
PZ-104-SS	11-Apr-13	D	1000 U	50 U	50 U	96 J	50 U	250 U	2100	50 U	51 J	0.2 U	200 U	250 U	100 U
PZ-104-SS	11-Apr-13	T	1000 U	50 U	50 U	99 J	50 U	250 U	2100	50 U	49 J	0.2 U	200 U	250 U	26 U
PZ-104-SS FD	11-Apr-13	D	1000 U	50 U	50 U	97 J	50 U	250 U	2100	50 U	48 J	0.062 J	200 U	250 U	100 U
PZ-104-SS FD	11-Apr-13	T	1000 U	50 U	50 U	98 J	50 U	250 U	2100	50 U	48 J	0.2 U	200 U	250 U	29 J
PZ-105-SS	04-Apr-13	D	1000 U	50 U	50 U	170 J	50 U	250 U	210 J	50 U	75 U	0.2 U	200 U	250 U	42 U
PZ-105-SS	04-Apr-13	T	1000 U	50 U	50 U	180 J	50 U	250 U	520	50 U	75 U	0.2 U	200 U	250 U	32 U
PZ-106-KS	15-Apr-13	D	200 U	10 U	2 U	45 J	10 U	5.1 J	380	10 U	10 J	0.2 U	40 U	50 U	6.8 U
PZ-106-KS	15-Apr-13	T	240	10 U	2.1 U	46 J	10 U	50 U	540	1.5 J	6.1 J	0.2 U	15 J	50 U	27
PZ-106-SD	09-Apr-13	D	1000 U	50 U	50 U	99 J	50 U	250 U	1100	50 U	130	0.062 J	200 U	250 U	38 J
PZ-106-SD	09-Apr-13	T	3300	50 U	50 U	140 J	50 U	250 U	5000	11 J	170	0.2 U	200 U	20 J	66 U
PZ-106-SS	09-Apr-13	D	1000 U	50 U	50 U	150 J	50 U	250 U	870	50 U	32 J	0.066 J	200 U	250 U	39 J
PZ-106-SS	09-Apr-13	T	1000 U	50 U	12 U	150 J	50 U	250 U	1000	50 U	32 J	0.2 U	200 U	250 U	28 U
PZ-107-AS	12-Apr-13	D	1000 U	50 U	50 U	620	50 U	250 U	2200	9 J	170	0.061 J	200 U	250 U	41 U
PZ-107-AS	12-Apr-13	T	59000	50 U	25 U	1100	67	250 U	37000	100	420	1.1	120 J	61 J	1000
PZ-109-SS	11-Apr-13	D	1000 U	50 U	50 U	68 J	50 U	250 U	500 U	50 U	75 U	0.2 U	200 U	250 U	40 U
PZ-109-SS	11-Apr-13	T	1000 U	50 U	50 U	67 J	50 U	250 U	500 U	10 J	75 U	0.2 U	200 U	250 U	39 U
PZ-110-SS	04-Apr-13	D	1000 U	50 U	50 U	320	50 U	250 U	6800	50 U	210	0.2 U	200 U	250 U	100 U
PZ-110-SS	04-Apr-13	T	1000 U	50 U	50 U	330	50 U	250 U	7600	50 U	190	0.2 U	200 U	250 U	100 U
PZ-111-KS	09-Apr-13	D	1000 U	50 U	50 U	250 U	50 U	250 U	180 J	50 U	75 U	0.2 U	200 U	250 U	31 J
PZ-111-KS	09-Apr-13	T	1500	50 U	13 U	250 U	50 U	250 U	700	50 U	75 U	0.2 U	200 U	250 U	42 U
PZ-111-SD	04-Apr-13	D	1000 U	50 U	50 U	120 J	50 U	250 U	500 U	50 U	75 U	0.077	200 U	250 U	28 U
PZ-111-SD	04-Apr-13	T	1000 U	50 U	50 U	120 J	50 U	250 U	500 U	50 U	75 U	0.2 U	200 U	250 U	100 U
PZ-112-AS	12-Apr-13	D	1000 U	50 U	190	2200	50 U	250 U	31000	50 U	170	0.2 U	200 U	250 U	100 U
PZ-112-AS	12-Apr-13	T	1000 U	50 U	180	2200	50 U	250 U	33000	50 U	170	0.2 U	200 U	250 U	30 U
PZ-113-AD	11-Apr-13	D	1000 U	50 U	50 U	2200	50 U	250 U	35000	50 U	650	0.083 J	200 U	250 U	30 U
PZ-113-AD	11-Apr-13	T	1000 U	50 U	50 U	2200	50 U	250 U	34000	7.5 U	650	0.08 J	200 U	250 U	27 U
PZ-113-AS	12-Apr-13	D	1000 U	50 U	10 J	670	50 U	250 U	4200	50 U	5500	0.2 U	200 U	250 U	100 U
PZ-113-AS	12-Apr-13	T	1000	50 U	14 J	700	50 U	21 J	7200	11 J	5500	0.2 U	200 U	250 U	40 U
PZ-113-SS	12-Apr-13	D	1000 U	50 U	50 U	190 J	50 U	250 U	500 U	50 U	37 J	0.2 U	200 U	250 U	26 U
PZ-113-SS	12-Apr-13	T	6800	50 U	50 U	210 J	25 J	250 U	7800	7.5 J	120	0.073 J	200 U	36 J	74 U
PZ-114-AS	08-Apr-13	D	1000 U	50 U	430	540	50 U	250 U	97000	50	3500	0.2 U	200 U	250 U	33 J
PZ-114-AS	08-Apr-13	T	540 J	50 U	420	650	50 U	250 U	99000	9.5 J	3400	0.2 U	200 U	31 U	42 U

Table 8: Summary of Detected Trace Metal Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
PZ-115-SS	05-Apr-13	D	200 U	10 U	4 U	260	10 U	13 J	1200	3.3 J	63	0.2 U	39 J	50 U	7.6 U
PZ-115-SS	05-Apr-13	T	1000 U	50 U	50 U	290	50 U	250 U	1700	50 U	44 J	0.2 U	200 U	250 U	100 U
PZ-116-SS	12-Apr-13	D	1000 U	50 U	50 U	65 J	50 U	250 U	500 U	50 U	75 U	0.2 U	200 U	250 U	41 U
PZ-116-SS	12-Apr-13	T	1000 U	50 U	50 U	66 J	50 U	250 U	500 U	50 U	75 U	0.2 U	200 U	250 U	44 U
PZ-200-SS	05-Apr-13	D	200 U	4.7 U	10 U	950	10 U	7.6 J	6000	4.9 J	6500	0.2 U	15 J	6.2 J	7.9 U
PZ-200-SS	05-Apr-13	T	660 J	50 U	50 U	980	50 U	250 U	9100	15 J	6200	0.2 U	200 U	250 U	100 U
PZ-201A-SS	08-Apr-13	D	1000 U	50 U	50 U	140 J	50 U	250 U	500 U	50 U	75 U	0.2 U	200 U	250 U	61 J
PZ-201A-SS	08-Apr-13	T	1000 U	50 U	11 U	130 J	50 U	250 U	520	50 U	87	0.2 U	200 U	250 U	50 U
PZ-202-SS	12-Apr-13	D	1000 U	50 U	50 U	400	50 U	250 U	1800	50 U	610	0.2 U	200 U	250 U	27 U
PZ-202-SS	12-Apr-13	T	1300	50 U	50 U	390	50 U	250 U	2800	9.5 J	620	0.2 U	200 U	250 U	100 J+
PZ-203-SS	05-Apr-13	D	200 U	4.2 U	10 U	90	10 U	5 J	210	10 U	25	0.2 U	40 U	50 U	5.4 U
PZ-203-SS	05-Apr-13	T	1000 U	50 U	50 U	94 J	50 U	250 U	250 J	10 J	24 J	0.2 U	200 U	250 U	100 U
PZ-204A-SS	08-Apr-13	D	1000 U	50 U	50 U	400	50 U	250 U	4000	50 U	2100	0.06 J	200 U	250 U	44 J
PZ-204A-SS	08-Apr-13	T	4500 J+	50 U	23 U	510	16 J	250 U	10000	18 J	2500	0.2 U	200 U	250 U	67 U
PZ-204-SS	09-Apr-13	D	1000 U	50 U	50 U	170 J	50 U	250 U	740	50 U	110	0.2 U	200 U	250 U	33 J
PZ-204-SS	09-Apr-13	T	2000	50 U	50 U	200 J	50 U	250 U	4700	11 J	120	0.2 U	200 U	250 U	79 U
PZ-205-AS	08-Apr-13	D	2000	50 U	25 J	1300	50 U	500	33000	50	640	0.062 J	400	500	53 J
PZ-205-AS	08-Apr-13	T	2100	50 U	32 U	1300	50 U	250 U	36000	11 J	650	0.2 U	200 U	250 U	37 U
PZ-205-SS	08-Apr-13	D	1000 U	50 U	50 U	150 J	50 U	250 U	500 U	50 U	75 U	0.064 J	200 U	250 U	67 J
PZ-205-SS	08-Apr-13	T	1000 U	50 U	50 U	140 J	50 U	250 U	300 J	50 U	75 U	0.2 U	200 U	250 U	37 U
PZ-206-SS	08-Apr-13	D	1000 U	50 U	50 U	66 J	50 U	250 U	220 J	50 U	37 J	0.2 U	200 U	250 U	50 J
PZ-206-SS	08-Apr-13	T	1400	50 U	50 U	82 J	50 U	250 U	2400	50 U	60 J	0.2 U	200 U	250 U	42 U
PZ-207-AS	03-Apr-13	D	1000 U	50 U	35 U	820	50 U	250 U	20000	50 U	100	0.099	200 U	250 U	38 J
PZ-207-AS	03-Apr-13	T	1000 U	50 U	29 J	860	50 U	250 U	21000	50 U	93	0.15 J	200 U	22 J	74 J
PZ-208-SS	12-Apr-13	D	1000 U	50 U	50 U	150 J	50 U	250 U	500 U	50 U	29 J	0.2 U	200 U	250 U	35 U
PZ-208-SS	12-Apr-13	T	1000 U	50 U	50 U	150 J	50 U	250 U	1000	50 U	33 J	0.2 U	200 U	250 U	64 U
PZ-302-AI	03-Apr-13	D	590 J	50 U	11 U	380	50 U	250 U	2700	50 U	280	0.2 U	200 U	250 U	60 J
PZ-302-AI	03-Apr-13	T	1000 U	50 U	50 U	360	50 U	250 U	1800	50 U	260	0.2 U	200 U	250 U	100 U
PZ-303-AS	04-Apr-13	D	1000 U	50 U	110	670	50 U	250 U	66000	50 U	1100	0.2 U	200 U	250 U	26 J
PZ-303-AS	04-Apr-13	T	750 J	50 U	110	790	50 U	250 U	76000	14 J	1100	0.2 U	200 U	250 U	100 U
PZ-304-AI	04-Apr-13	D	1000 U	50 U	11 U	1200	50 U	250 U	16000	50 U	1300	0.087	200 U	250 U	30 U
PZ-304-AI	04-Apr-13	T	1000 U	50 U	50 U	1200	50 U	250 U	16000	50 U	1200	0.11 J	200 U	250 U	100 U

Table 8: Summary of Detected Trace Metal Results - April 2013 Groundwater Sampling, West Lake Landfill, OU-1

Sample ID	Sample Date	Sample Fraction	Alumi-num	Anti-mony	Arsenic	Barium	Chro-mium	Cobalt	Iron	Lead	Manga-nese	Mer-cury	Nickel	Vana-dium	Zinc
PZ-304-AS	04-Apr-13	D	1000 U	50 U	230	1800	50 U	250 U	28000	50 U	120	0.1 J+	77 J	250 U	100 U
PZ-304-AS	04-Apr-13	T	1000 U	50 U	230	1900	50 U	250 U	29000	50 U	110	0.078 J	80 J	250 U	26 J
PZ-305-AI	05-Apr-13	D	200 U	4.3 U	14 J+	700	10 U	50 U	34000	4.8 J	3100	0.2 U	40 U	5.6 U	12 U
PZ-305-AI	05-Apr-13	T	6500 J	50 U	11 J	820	50 U	250 U	42000	19 J	3200	0.2 U	200 U	250 U	59 J
PZ-305-AI FD	05-Apr-13	D	200 U	5.4 U	16	690	10 U	4.1 J	34000	5.2 J	3100	0.2 U	40 U	4.3 U	8.7 U
PZ-305-AI FD	05-Apr-13	T	9800 J	50 U	17 J	930	23 J	250 U	45000	27 J	3300	0.2 U	200 U	34 J	93 J

Notes:

All values are in units of micrograms per liter (ug/l)

Sample Fractions - D-Dissolved (filtered sample); T - Total (unfiltered sample)

FD - Field duplicate sample

Data Validation Qualifiers (Final Q) include:

U = non-detect at the reported value

J = estimated result

J+ = estimated result which may be biased high

J- = estimated result which may be biased low

UJ = non-detect at the estimated reported value

UJ- = non-detect at the estimated reported value which may be biased low

Table 9: Summary of Most Frequently Detected Volatile Organic Compounds - April 2013 Groundwater Sampling

Sample ID	Sample Date	Benzene	Ethyl Benzene	M, P-Xylenes	O-Xylene	Total Xylenes	Isopropyl-benzene (Cumene)	Methyl tert-butyl ether	Chloro-benzene	1,4-Dichloro-benzene	Chloro-ethane	cis-1,2-Dichloro-ethene	Vinyl chloride
S-5	4/11/13	4.7 J	5 U	13	6.6	20	1.5 J	0.53 J	3.1 J	9.8	0.49 J	5 U	5 U
S-8	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
S-10	4/4/13	2.4 J	0.35 J	5 U	5 U	10 U	5 U	0.58 J	9.6	1.4 J	2.1 J	1.8 J	0.75 J
S-53	4/11/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
S-61	4/5/13	5 U	0.37 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	0.63 J	5 U
S-82	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	0.87 J	5 U	10 U	1.3 J	5 U
S-84	4/11/13	3.5 J	5 U	5 U	5 U	10 U	5 U	5 U	11	5 U	10 U	0.6 J	5 U
I-4	4/12/13	4.8 J	5 U	8.9	4.6 J	14	2.4 J	0.7 J	9.9	8.4	10 U	0.17 J	5 U
I-9	4/9/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	2.8 J
I-9 FD	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 UJ-	5 U	2.4 J
I-11	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	1.1 J	5 U	4.5 J	2.1 J	5 U
I-62	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-62 FD	4/4/13	5 U	0.33 J	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-65	4/16/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-65 FD	4/16/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-66	4/5/13	5 U	0.32 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-67	4/5/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-67 FD	4/5/13	5 U	0.38 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-68	4/9/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
I-73	4/12/13	12	0.46 J	5 U	5 U	10 U	5 U	0.65 J	6.8	5 U	10 U	7.7	1.7 J
D-3	4/11/13	0.29 U	5 U	5 U	5 U	10 U	5 U	5 U	1.5 J	5 U	10 UJ-	5 U	5 U
D-6	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	6.2	5 U	5 U	10 U	5 U	5 U
D-12	4/4/13	5 U	5 U	0.68 J	5 U	10 U	5 U	5 U	5 U	5 U	10 U	0.73 J	5 U
D-12 FD	4/4/13	5 U	0.37 J	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	0.55 J	5 U
D-13	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	12	5 U	5 U	10 U	5 U	5 U
D-14	4/12/13	13	0.79 J	3.2 J	1.5 J	4.7 J	2.5 J	0.89 J	53	13	10 U	5 U	0.63 J
D-81	4/3/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	0.78 J	5 U
D-83	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	1.1 J	0.76 J	5 U	10 U	5 U	5 U
D-85	4/11/13	0.73 J	5 U	5 U	5 U	10 U	5 U	5 U	59	5 U	10 U	5 U	5 U
D-87	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
D-93	4/9/13	1.6 J	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	22	23
LR-100	4/3/13	7.7	5 U	5 U	0.35 J	10 U	16	5 U	54	6.3	0.46 J	5 U	5 U

Table 9: Summary of Most Frequently Detected Volatile Organic Compounds - April 2013 Groundwater Sampling

Sample ID	Sample Date	Benzene	Ethyl Benzene	M, P-Xylenes	O-Xylene	Total Xylenes	Isopropyl-benzene (Cumene)	Methyl tert-butyl ether	Chloro-benzene	1,4-Dichloro-benzene	Chloro-ethane	cis-1,2-Dichloro-ethene	Vinyl chloride
LR-103	4/3/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	1.1 J	5 U	10 U	5 U	0.54 J
LR-104	4/4/13	5 U	0.36 J	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	0.65 J	5 U
LR-105	4/3/13	8.2	1.1 J	16	1.1 J	17	40	0.5 J	220	33	0.96 J	5 U	5 U
MW-103	4/5/13	5 U	0.31 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
MW-104	4/5/13	0.75 J	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
MW-1204	4/12/13	5 U	5 U	5 U	5 U	10 U	5 U	1.1 J	5 U	5 U	10 U	5 U	5 U
MW-1204 FD	4/12/13	5 U	5 U	5 U	5 U	10 U	5 U	1.1 J	0.92 J	5 U	10 U	5 U	5 U
PZ-100-KS	4/16/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-100-SD	4/5/13	5 U	0.33 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-100-SS	4/5/13	5 U	0.3 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-101-SS	4/12/13	0.81 J	5 U	5 U	5 U	10 U	5 U	0.65 J	1.7 J	5 U	10 U	5 U	5 U
PZ-102R-SS	4/11/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-102-SS	4/11/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-103-SS	4/8/13	4.1 J	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-104-KS	4/11/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-104-SD	4/11/13	820	18	33	11	44	1.4 J	3.3 J	5 U	4.1 J	2.1 J	5 U	5 U
PZ-104-SS	4/11/13	1900	25	46	19	65	2.6 J	7.5	5 U	7.4	4.3 J	5 U	5 U
PZ-104-SS FD	4/11/13	2000	24	43	18	61	2.5 J	7	5 U	6.5	4.6 J	5 U	5 U
PZ-105-SS	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-106-KS	4/15/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-106-SD	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-106-SS	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-107-AS	4/12/13	5 U	0.32 J	5 U	5 U	10 U	5 U	0.63 J	5 U	5 U	10 U	0.24 J	5 U
PZ-109-SS	4/11/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-110-SS	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	2.2 J	0.78 J
PZ-111-KS	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-111-SD	4/4/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-112-AS	4/12/13	34	0.87 J	0.62 J	0.33 J	0.95 J	1.6 J	0.53 J	3000	19	1.6 J	0.34 J	5 U
PZ-113-AD	4/11/13	3.1 J	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-113-AS	4/12/13	5 U	5 U	5 U	5 U	10 U	5 U	1.8 J	5 U	5 U	10 U	5 U	5 U
PZ-113-SS	4/12/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-114-AS	4/8/13	7.4	5 UJ-	5 U	5 U	10 U	5 U	5 U	53	4.5 J	10 U	5 U	5 U

Table 9: Summary of Most Frequently Detected Volatile Organic Compounds - April 2013 Groundwater Sampling

Sample ID	Sample Date	Benzene	Ethyl Benzene	M, P-Xylenes	O-Xylene	Total Xylenes	Isopropyl-benzene (Cumene)	Methyl tert-butyl ether	Chloro-benzene	1,4-Dichloro-benzene	Chloro-ethane	cis-1,2-Dichloro-ethene	Vinyl chloride
PZ-115-SS	4/5/13	5 U	0.34 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-116-SS	4/12/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-200-SS	4/5/13	5 U	0.38 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-201A-SS	4/8/13	0.92 J	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-202-SS	4/12/13	4.4 J	5 U	5 U	5 U	10 U	5 U	2.4 J	0.78 J	5 U	10 U	5 U	5 U
PZ-203-SS	4/5/13	5 U	0.31 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-204A-SS	4/8/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-204-SS	4/9/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-205-AS	4/8/13	200	29 J-	40	8.8	49	6.2	5 U	65	5 U	10 U	5 U	5 U
PZ-205-SS	4/8/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-206-SS	4/8/13	5 U	5 UJ-	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-207-AS	4/3/13	2.3 J	5 U	5 U	5 U	10 U	1.8 J	0.79 J	16	3.6 J	10 U	5 U	5 U
PZ-208-SS	4/12/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	0.17 J	5 U
PZ-302-AI	4/3/13	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U
PZ-303-AS	4/4/13	68	45	310	78	390	4.9 J	5 U	5 U	5 U	7 J	1.1 J	1.1 J
PZ-304-AI	4/4/13	0.95 J	5 U	5 U	5 U	10 U	0.27 J	5 U	5.8	1.2 J	10 U	2.5 J	2.5 J
PZ-304-AS	4/4/13	10	0.3 J	5 U	5 U	10 U	0.53 J	0.52 J	53	12	10 U	0.41 J	5 U
PZ-305-AI	4/5/13	1.2 J	0.41 U	5 U	5 U	10 U	5 U	5 U	3.9 J	5 U	10 U	5 U	5 U
PZ-305-AI FD	4/5/13	1.2 J	0.31 U	5 U	5 U	10 U	5 U	5 U	3.9 J	5 U	10 U	5 U	5 U

Notes:
All values are
FD - Field duplicate sample
Data Validation Qualifiers (Final Q) include:
U = non-detect at the reported value
J = estimated result
J- = estimated result which may be biased low
UJ = non-detect at the estimated reported value

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Figures

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Existing 10' Contours
- Building or Structure
- Property Line
- Fence
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Generalized Stratagraphic Column

System	Series	Group	Formation	Thickness (ft)	Dominant Lithology
Quaternary	Holocene		Alluvium	0-150	Sand, gravel, silt, and clay.
	Pleistocene		Loess Glacial Till	1-110 0-55	Silt. Pebbly clay and silt.
Pennsylvanian	Missourian	Pleasanton	Undifferentiated	0-75	Shales, siltstones, "dirty" sandstones, coal beds and thin limestone beds.
	Desmoinesian	Marmaton	Undifferentiated	0-90	
		Cherokee	Undifferentiated	0-200	
	Atokan		Cheltenham Formation	unknown	
Mississippian	Meremacian		Ste. Genevieve Formation	0-160	Argillaceous to arenaceous limestone.
			St. Louis Limestone	0-180	
			Salem Formation	0-180	
			Warsaw Formation	0-110	Shales in upper portion, limestone in lower portions.
	Osagean		Burlington-Keokuk Formation	0-240	Cherty limestone.
			Fern Glen Formation	0-105	Red limestone and shale.

Figure 1

Base Map

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

- 440 — Groundwater Elevation Contour (FAMSL) - Leachate
- 440 — Groundwater Elevation Contour (FAMSL) - Alluvium
- 440 — Groundwater Elevation Contour (FAMSL) - St. Louis Fm
- (279.02) Leachate Groundwater Elevation (FAMSL)
- (429.82) Alluvium Groundwater Elevation (FAMSL)
- (458.64) St. Louis Fm Groundwater Elevation (FAMSL)
- * Groundwater Elevation not used for contouring
- Groundwater Flow Direction - Leachate
- Groundwater Flow Direction - Alluvium
- Groundwater Flow Direction - St. Louis Fm
- (FAMSL) Feet above mean sea level

WELL FORMATION DESIGNATIONS

- LR or MW: Undifferentiated
- S or AS: Alluvial Shallow Well
- I or AI: Alluvial Intermediate Well
- D or AD: Alluvial Deep Well
- SS: St. Louis Formation Well
- SD: Salem Formation Well
- KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 2
Alluvial Groundwater Table and
St. Louis FM. Potentiometric Elevation Map
April 2, 2013
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

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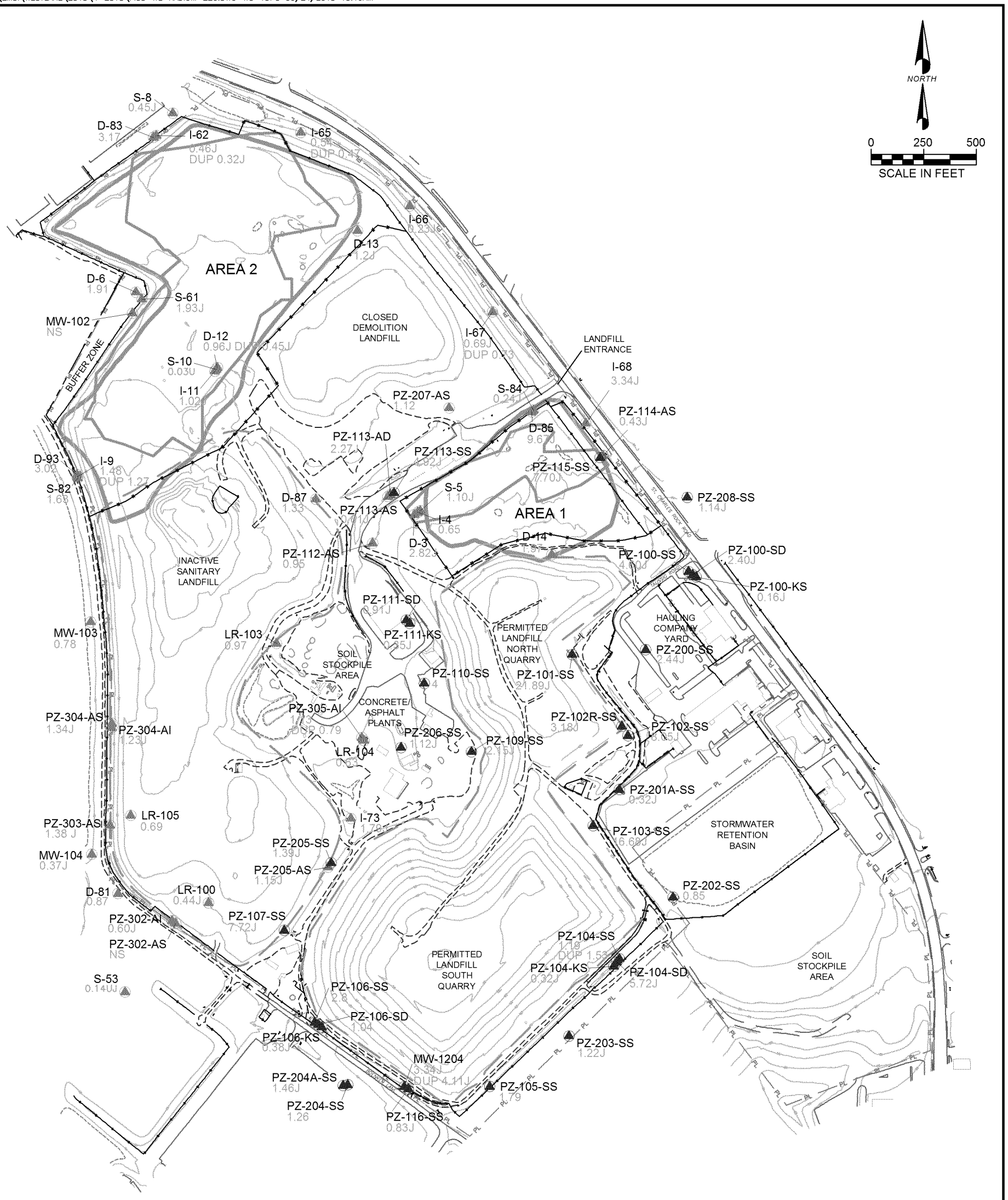

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

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NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092 Radium-226 (pCi/L)
NS Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = Esitmated result which may be biased high

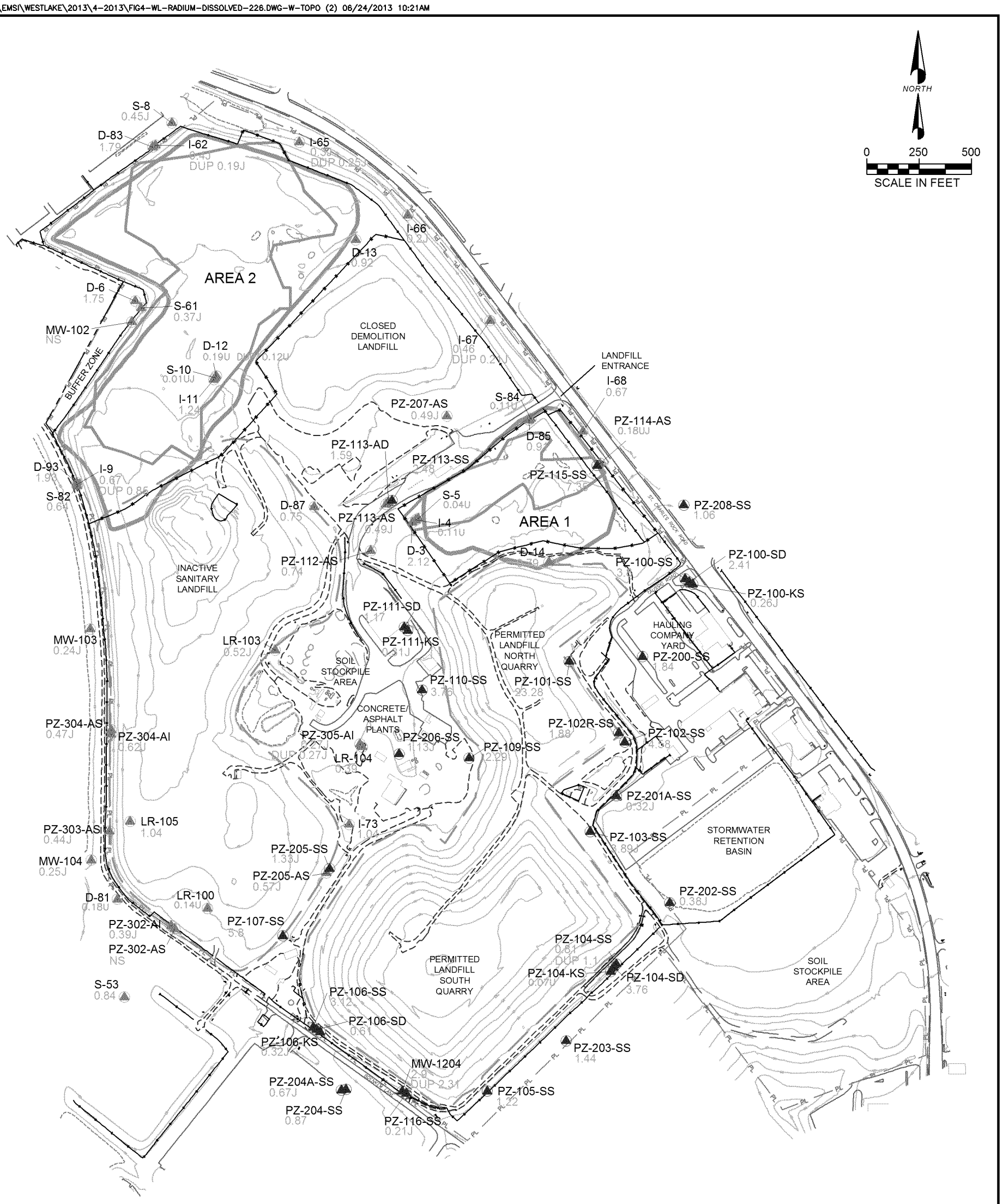
Figure 3

Total Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG4-WL-RADIUM-DISSOLVED-226.DWG-W-TOPO (2) 06/24/2013 10:21AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092 Radium-226 (pCi/L)
NS Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

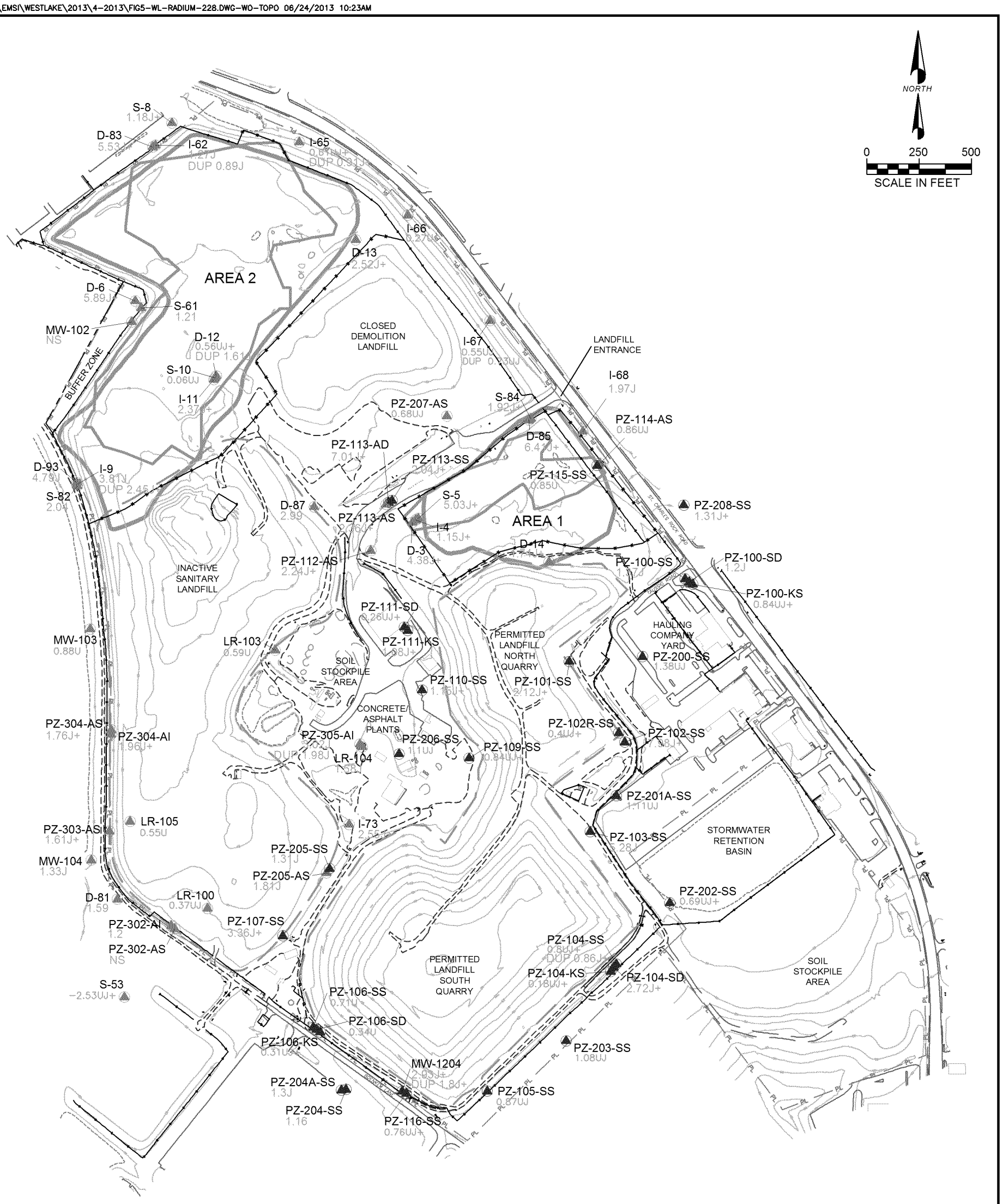
Figure 4

Dissolved Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG5-WL-RADIUM-228.DWG-WO-TOPO 06/24/2013 10:23AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092 Radium-228 (pCi/L)
NS Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

Figure 5

Total Radium-228 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG6-WL-RADIUM-DISSOLVED-228.DWG-WO-TOPO 06/24/2013 10:25AM

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092 Radium-228 (pCi/L)
NS Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

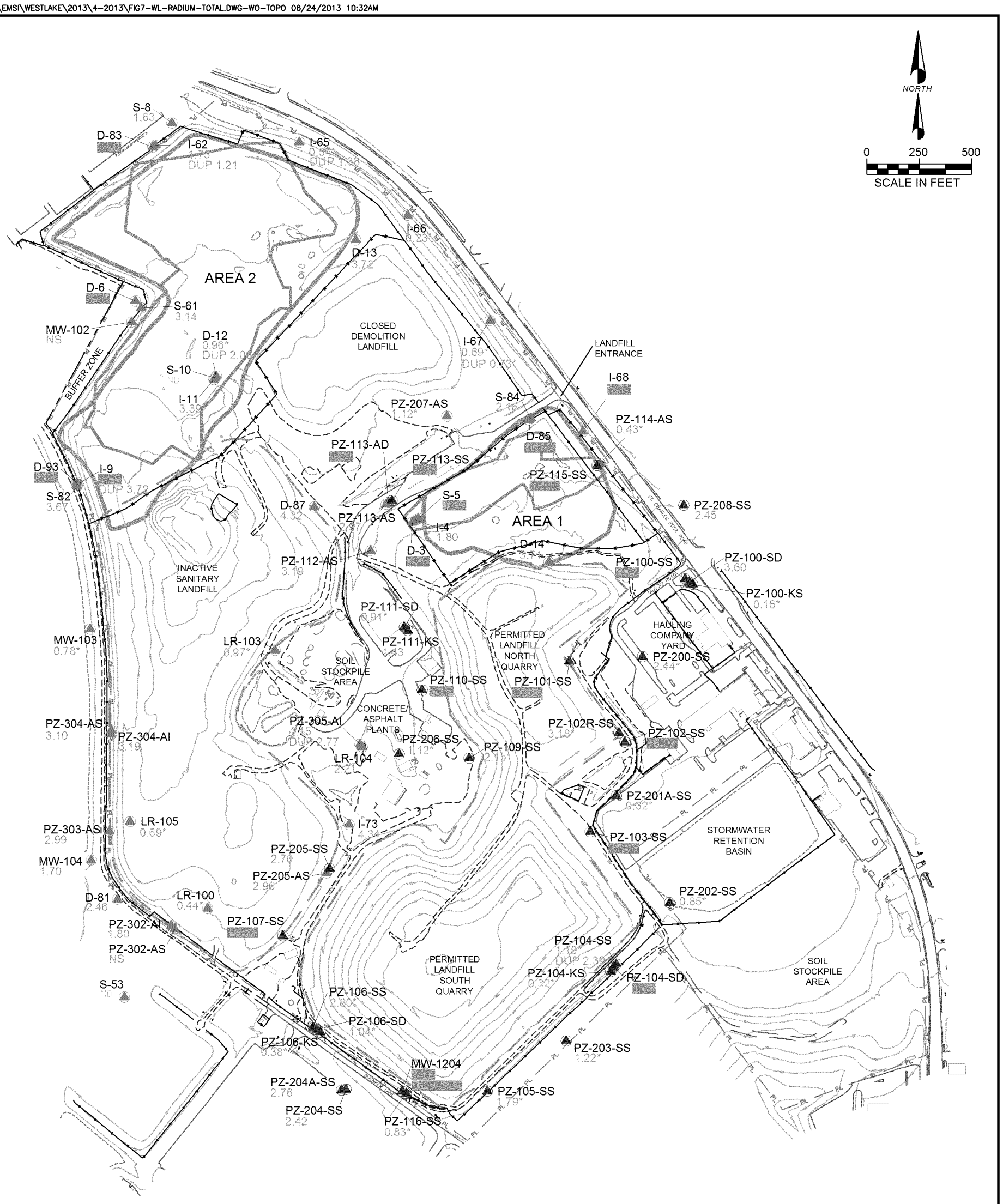
Figure 6

Dissolved Radium-228 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG7-WL-RADIUM-TOTAL.DWG-WO-TOPO 06/24/2013 10:32AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

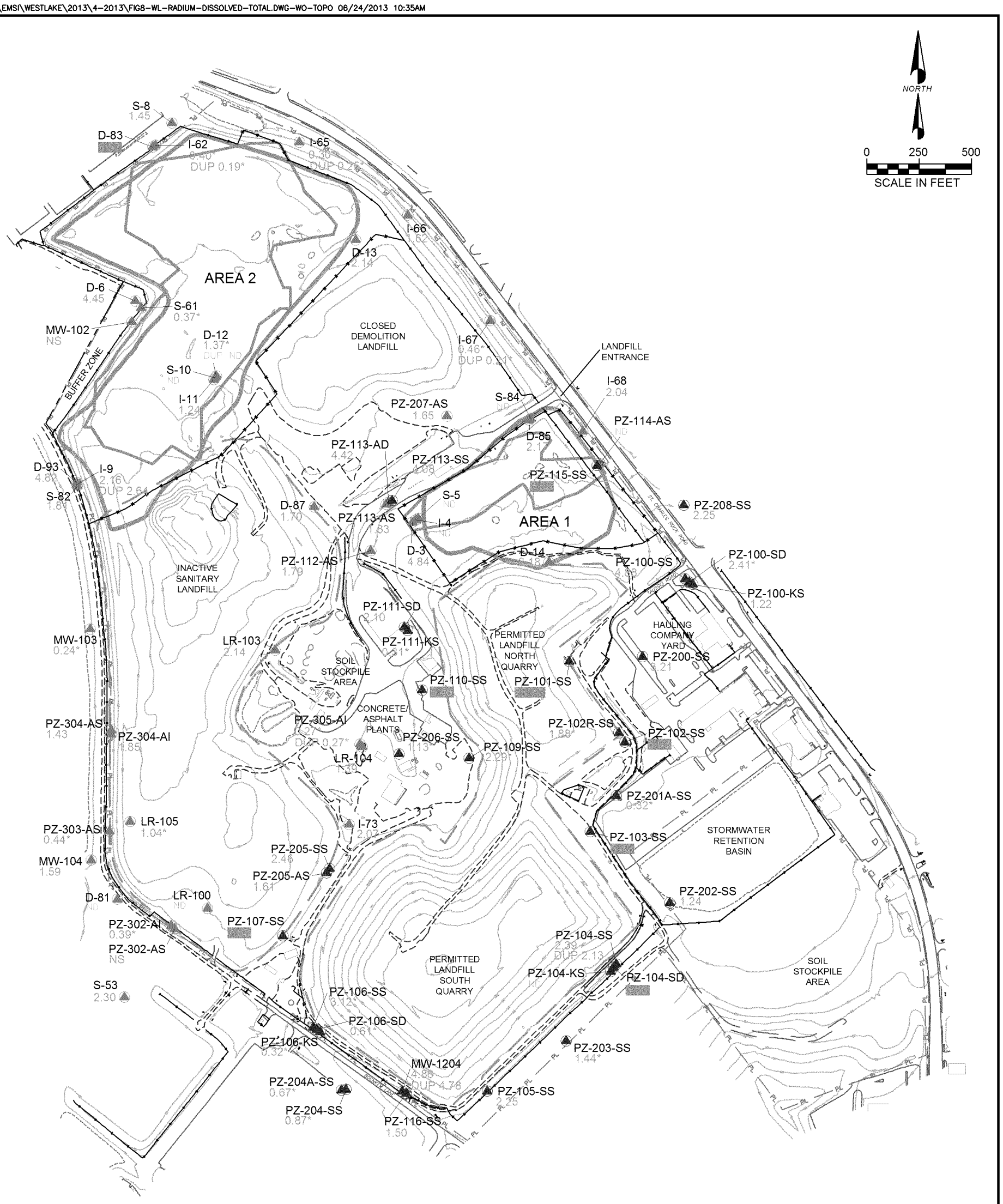
RADIUM EXPLANATION

1.72	Total Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
4.50*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
	Total Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect
NS	Not Sampled

Figure 7
Combined
Total Radium-226 + Total Radium-228
in Groundwater
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG8-WL-RADIUM-DISSOLVED-TOTAL.DWG-WO-TOPO 06/24/2013 10:35AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

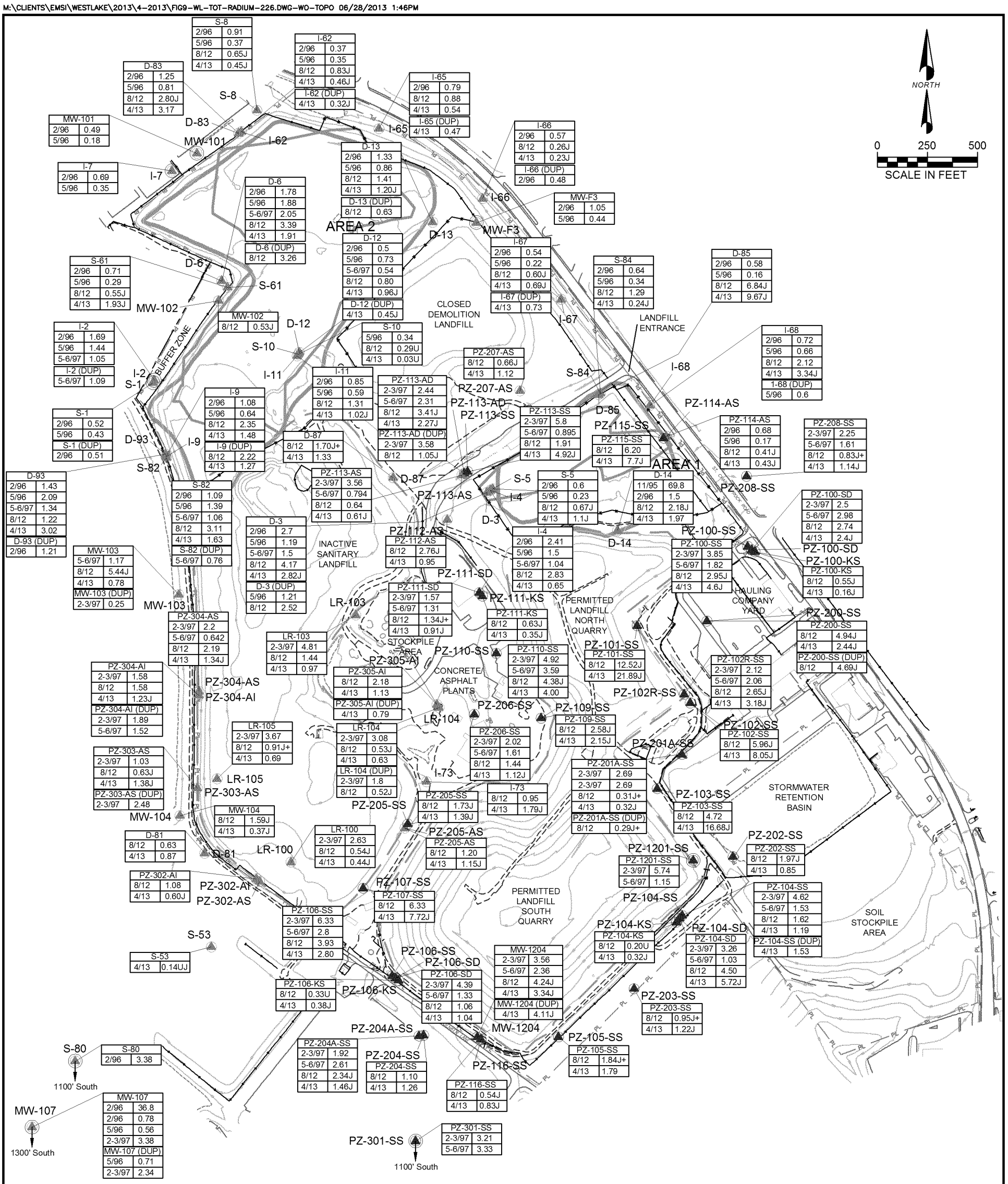
RADIUM EXPLANATION

.092	Total Dissolved Radium that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
1.08*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
	Total Dissolved Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect
NS	Not Sampled

Figure 8
Combined
Dissolved Radium-226 + Dissolved Radium-228
in Groundwater
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG9-WL-TOT-RADIUM-226.DWG-WO-TOPO 06/28/2013 1:46PM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- RI/FS Groundwater Well That No Longer Exists
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
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SD: Salem Formation Well
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UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

RADIUM EXPLANATION

Well Number — MW-1204
Date Sampled — 2-3/97 — 3.56 — Total Radium-226 Concentration in (pCi/L)

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/96, 5/96, 5/97, 3/04, and 5/04
OU-2 Wells Sampled 2-3/97 and 5-6/97

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

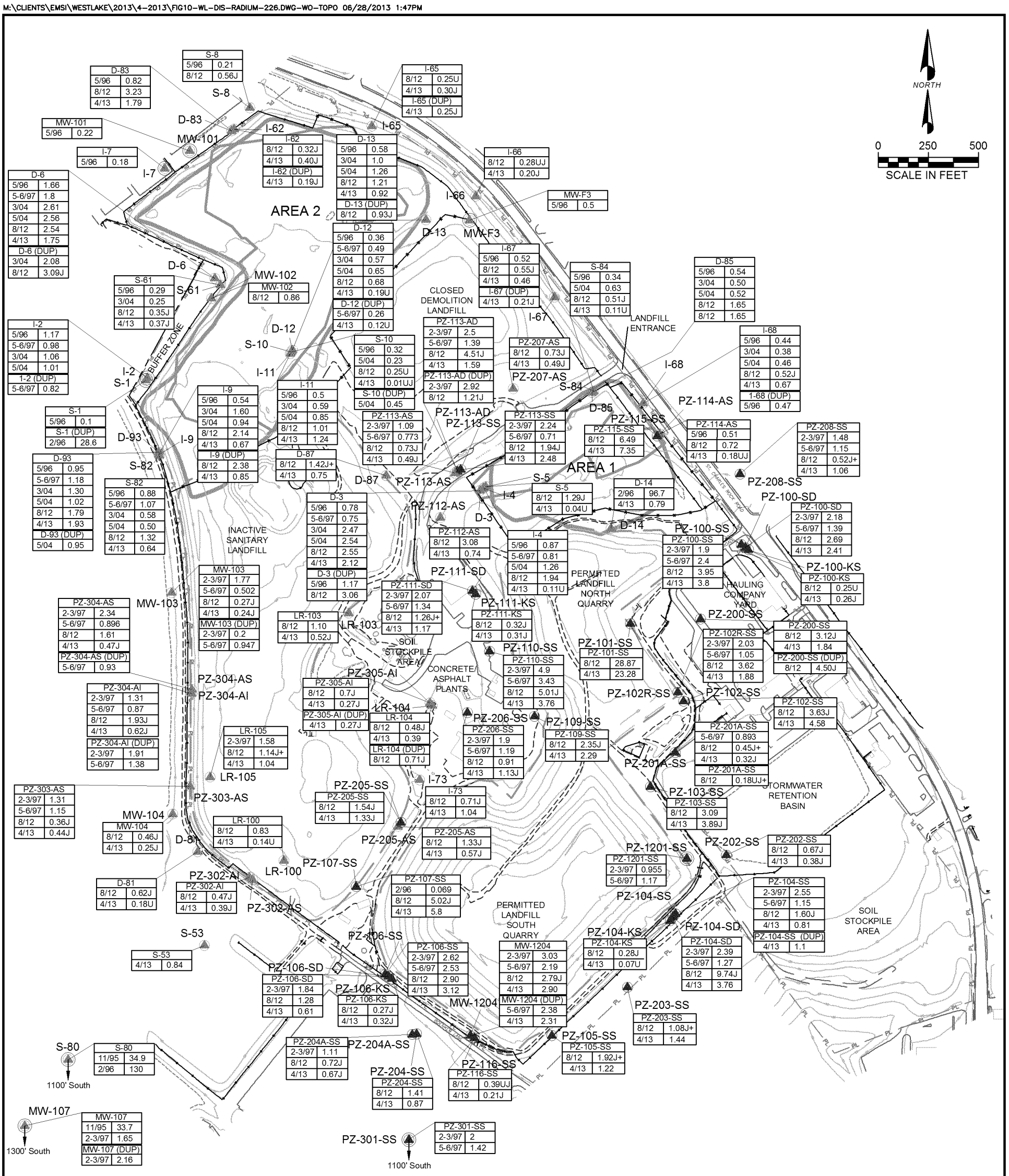
Figure 9

2013, 2012 and RI/FS Results for Total Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\4-2013\FIG10-WL-DIS-RADIUM-226.DWG-WO-TOPO 06/28/2013 1:47PM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- RI/FS Groundwater Well That No Longer Exists
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
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Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
J = Estimated result
J+ = esitmated result which may be biased high

RADIUM EXPLANATION

Well Number — MW-1204
Date Sampled — 2-3/97 — 3.03 — Dissolved Radium-226 Concentration in (pCi/L)

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/96, 5/96, 5/97, 3/04, and 5/04
OU-2 Wells Sampled 2-3/97 and 5-6/97

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 10

2013, 2012 and RI/FS Results for Dissolved Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

Appendices

(on compact disk)