Luminant Generation Company LLC
Luminant
6555 Sierra Dr.
Irving, TX 75039

November 30, 2021

Mr. Michael S. Regan, Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460
Mail Code 1101A

Re: Martin Lake Steam Electric Station Alternative Liner Demonstration

Dear Administrator Regan:

Luminant Generation Company LLC (Luminant) hereby submits this Alternative Liner Demonstration (ALD) to the U.S. Environmental Protection Agency pursuant to 40 C.F.R. § 257.71(d)(1)(ii) for the Permanent Disposal Pond 5 (PDP-5) located at Martin Lake Steam Electric Station near Tatum, Texas.

On November 25, 2020, Luminant timely submitted to EPA a complete ALD application for PDP-5 that met all of the requirements of 40 C.F.R. § 257.71(d)(1)(i) and placed the complete application in the facility's operating record. The submission of the complete application tolled the deadline for PDP-5 to cease receipt of waste. 40 C.F.R. § 257.71(d)(2)(iii)(A). Because EPA did not notify Luminant that its application was incomplete by the deadline announced by EPA in the preamble to the final rule (April 11, 2021), 85 Fed. Reg. 72,506, 72,528 (Nov. 12, 2020), Luminant considers the application to be deemed complete by operation of law and fully approvable.

Under EPA's regulations, EPA was required to issue a final decision on the application within sixty days of Luminant's submission of the complete application—*i.e.*, no later than January 24, 2021. However, EPA has not made a final decision or published a proposed decision, as required by the regulations. *See* 40 C.F.R. § 257.71(d) ("The Administrator . . . will act on the submissions in accordance with the procedures in paragraph (d)(2) of this section."); *id*. 257.71(d)(2)(iii)(C) ("EPA will issue its decision on the application within sixty days of receiving a complete application."). Thus, EPA's regulations, properly implemented, would have provided Luminant with ten months to prepare its ALD for PDP-5 and to do so in light of EPA's review and approval of its application. EPA's inaction has prejudiced Luminant in its preparation of the ALD for PDP-5.

Further, because EPA has not issued a final decision at all, Luminant's obligation to submit an ALD has not yet arisen under the regulations. The obligation to submit an ALD by November 30, 2021, is only triggered "[i]f the application is approved[.]" 40 C.F.R. § 257.71(d)(1)(ii). Given the required 20-day comment period, *id*. § 257.71(d)(2)(iii)(C), EPA's delay means that the agency will be unable to issue a final decision

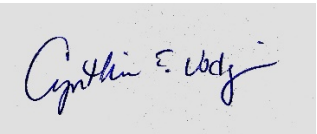
before the November 30, 2021 deadline, and thus the requirement for Luminant to submit an ALD by that deadline (or at all) is inapplicable and no longer operative. Given Luminant's submission of a complete application, the tolling of the cease receipt deadline remains, and will continue to remain, in place.

EPA has recognized the problem created by its inaction and the resulting confusion and prejudice for applicants like Luminant. EPA has explained that because "EPA has not yet issued approvals and denials for submitted Part B applications, the time to conduct the demonstration work is narrowing, such that a facility may have difficulty completing the demonstration in the time between an approval and the November 30, 2021 deadline." EPA, Coal Combustion Residuals (CCR) Part B Implementation, Information About the November 30, 2021 Deadline, https://www.epa.gov/coalash/coal-combustion-residuals-ccr-part-b-implementation#Info (last visited Nov. 29, 2021). EPA has further assured applicants that "EPA . . . intends to take actions to ensure that any facility approved to conduct a demonstration has the same amount of time anticipated by the current regulation to initiate and complete the demonstration after an approval." *Id*. Luminant appreciates EPA's intention of rectifying the situation and providing facilities with the ten-month preparation time after the approval of the application, as provided in the regulations. Luminant looks forward to EPA's upcoming actions to ensure that facilities are provided the full ten months in which to prepare their ALD submissions following EPA's approval of an application.

Given the uncertainty that EPA's delay has created, Luminant is submitting the enclosed ALD by the November 30, 2021 deadline that would have applied had EPA acted in a timely fashion. The enclosed ALD addresses the criteria and requirements of 40 C.F.R. § 257.71(d)(1)(ii). As noted in the ALD, there is additional information that Luminant is continuing to collect and that it would have provided in the ALD had Luminant been afforded the full ten-month period. That additional information will be submitted to EPA once it is available, as a supplement to Luminant's complete application as permitted by the regulations. *See* 40 C.F.R. § 257.71(d)(iv). Further, if and when EPA issues a final approval of Luminant's application for PDP-5, Luminant reserves the right to submit a further revised or different ALD within ten months of EPA's final decision, as contemplated by the regulations.

As allowed by the agency, in lieu of hard copies of these documents, electronic files for the ALD were submitted to Richard Huggins, Mary Jackson, Michelle Long, and Jason Mills via email. If you have any questions regarding the ALD submittal, please contact Renee Collins at 214-875-8338 or renee.collins@luminant.com.

Sincerely,



Cynthia Vodopivec
Senior Vice President, Environmental Health & Safety

Enclosure
cc: Richard Huggins (via email)
Mary Jackson (via email)
Michelle Long (via email)
Jason Mills (via email)

ALTERNATE LINER DEMONSTRATION

Martin Lake Steam Electric Station - PDP-5
Rusk County, Texas

Submitted to:

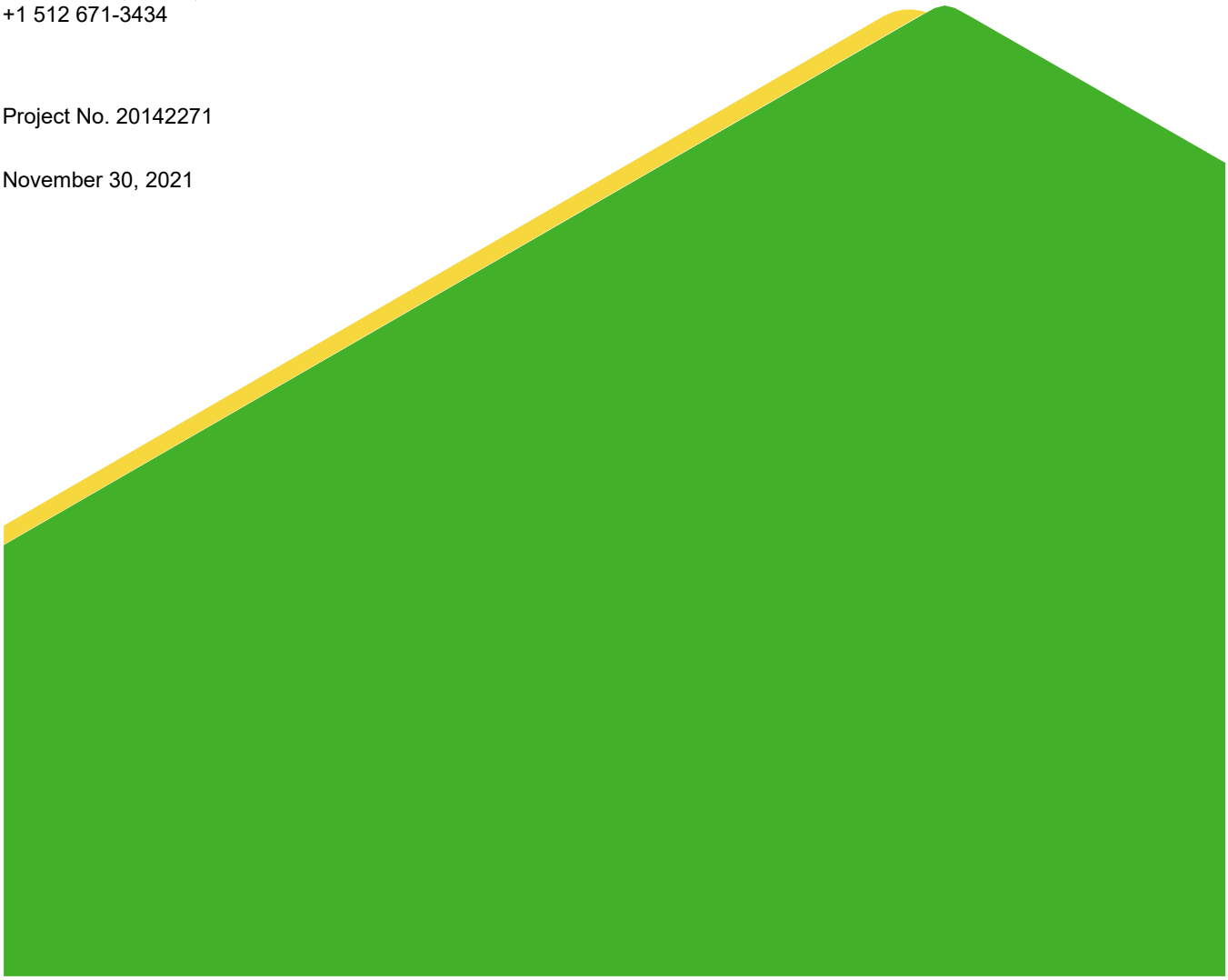
Luminant Generation Company LLC

Submitted by:

Golder Associates Inc.
2201 Double Creek Dr
Suite 4004
Round Rock, Texas, USA 78664
+1 512 671-3434

Project No. 20142271

November 30, 2021



PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that this Alternate Liner Demonstration has been prepared in accordance with the requirements of 40 C.F.R. § 257.71(d)(1)(ii).

Patrick J. Behling, P.E.
Principal Engineer
Golder Associates Inc.
Firm Registration No. F-2578

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TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Pursuant to 40 C.F.R. § 257.71(d)(1)(ii), Golder Associates Inc. (Golder) has prepared this Alternate Liner Demonstration (ALD) on behalf of Luminant Generation Company LLC (Luminant) for Permanent Disposal Pond 5 (PDP-5) located at the Martin Lake Steam Electric Station (MLSES) in Rusk County, Texas. PDP-5 is used to store CCRs from other MLSES CCR surface impoundments during cleaning cycles and for storage of water from large precipitation events and excess process wastewater from the MLSES flue gas desulfurization (FGD) system (scrubber gypsum) and bottom ash transport systems. PDP-5 is active and is considered an Existing CCR Surface Impoundment under 40 C.F.R. Part 257, Subpart D (the Coal Combustion Residuals (CCR) Rule).

PDP-5 is constructed with a compacted clay liner (CCL) measuring 3 feet thick on the sides of the perimeter berms and 2 feet thick on the bottom of the impoundment. The CCL exhibits a hydraulic conductivity of no more than 1 X 10^{-7} cm/sec. The liner for PDP-5 is:

- Not a composite liner that meets the requirements of § 257.70(b) as specified in § 257.71(a)(1)(ii) of the CCR Rule; and
- Not an alternative composite liner that meets the requirements of § 257.70(c) as specified in § 257.71(a)(1)(iii) of the CCR Rule.

The objective of this ALD is to demonstrate that, based on the construction of PDP-5 and surrounding site conditions, there is no reasonable probability that operation of PDP-5 will result in concentrations of Appendix IV constituents in the uppermost aquifer at levels above a groundwater protection standard. beyond the boundaries of PDP-5. This ALD was prepared in accordance with § 257.71(d)(1)(ii).

1.1 ALD Application

Luminant prepared an ALD application for PDP-5 in accordance with § 257.71(d)(1)(i) to serve as notice that Luminant intended to submit an ALD to USEPA to demonstrate that the design of the PDP-5 liner system performs equivalent to a composite liner as defined in § 257.70(b) (Golder, 2020a). The ALD Application was transmitted to USEPA prior to the November 30, 2020 application deadline specified in § 257.71(d)(1)(ii)(D)(2). To date, Luminant has not received a response from EPA concerning the submitted ALD Application.

1.2 PDP-5 Location and Configuration

PDP-5 was constructed in 2010 and is located approximately 3,000 feet west of the MLSES power units and approximately 1,500 feet from the nearest branch of Martin Lake (Figure 1). PDP-5 is registered with the Texas Commission on Environmental Quality (TCEQ) as industrial solid waste management unit (WMU) No. 024 under Solid Waste Registration No. 31227.

PDP-5 and adjacent areas are shown on Figure 2. PDP-5 was constructed above grade and is surrounded by earthen embankments that extend approximately 10 to 15 feet above the adjacent ground surface (B&M, 2016b). The elevation of the top of the PDP-5 berms is approximately El. 405.5. The maximum operating water surface elevation in PDP-5 is approximately El. 403.5.

PDP-5 was constructed on top of three closed in-place, non-CCR Rule regulated, former coal ash surface impoundments (PDP-1, PDP-2 and PDP-3) that historically received wastewater streams and solids similar to those currently managed in PDP-5. The configuration of PDP-5 relative to the closed underlying former impoundments is shown on Figures 3, 4 and 5. As shown on the figures, the lateral extent of PDP-5 is wholly contained within the boundaries of the underlying closed PDP-1, -2 and -3.

Key design and operating characteristics for PDP-1, -2 and -3 can be summarized as follows:

- PDP-1. PDP-1 was constructed in 1979 and covered an area of approximately 15 acres. The impoundment was lined with a 36 mil Hypalon liner underlain by an unconfirmed thickness of compacted clay on the bottom and side walls. PDP-1 operated from 1979 until 1981. Fluids from PDP-1 were drained and PDP-1 was capped with an interim clay/soil cap in 1983. PDP-1 is registered with the TCEQ as WMU-004.
- PDP-2. PDP-2 was constructed in 1981 and covered an area of approximately 10 acres. The impoundment was lined with a 3 feet thick compacted clay liner. PDP-2 operated from 1981 until 1983. Fluids were drained from PDP-2 and PDP-2 was capped with an interim soil cap in 1983. PDP-2 is registered with the TCEQ as WMU-005.
- PDP-3. PDP-3 was constructed in 1982 and covered an area of approximately 27 acres. The impoundment was lined with a 3 feet thick compacted clay liner on the sides of the perimeter berms and 2 feet thick compacted clay liner on the bottom of the pond. The bottom liner was underlain by a 1.5 feet thick sand blanket and an additional 1 foot-thick layer of compacted clay. PDP-3 was placed into operation in 1982 and operated until PDP-5 was constructed in 2010. PDP-3 is registered with the TCEQ as WMU-006.

PDP-1, -2 and -3 were capped/closed as landfills as part of the construction of PDP-5. Fluids were drained from PDP-3 prior to closure and the PDP-5 CCL was constructed to serve as a low permeability clay cap for the closed PDP-1, -2 and -3. TCEQ approved closure of PDP-1, -2 and -3 in 2015 (TCEQ, 2015).

A fourth closed in-pace, non-CCR Rule regulated former coal ash surface impoundment (PDP-4) is located adjacent to PDP-5 to the south. PDP-4 was constructed in 1982 and covered an area of approximately 15 acres. The impoundment was lined with a 36 mil Hypalon liner underlain by a 3 feet thick compacted clay liner and is registered with the TCEQ as WMU-008. PDP-4 began operating in 1982 and stopped receiving coal ash prior to the October 2015 effective date of the CCR Rule. PDP-4 is registered with the TCEQ as WMU-008. Fluids were drained from PDP-4 and PDP-4 was capped/closed in-place as a landfill. TCEQ approved closure of PDP-4 in 2017 (TCEQ, 2017).

1.3 PDP-5 Liner Construction Documentation

PDP-5 is constructed with a compacted clay liner measuring 3 feet thick on the sides of the perimeter berms and 2 feet thick on the bottom of the impoundment. The CCL exhibits a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The PDP-5 CCL also serves as the low permeability clay cap for the closed PDP units upon which PDP-5 was constructed (PDP-1, -2 and -3) and the CCL extends beyond the exterior toe of the perimeter berms of PDP-5 as shown on Figures 3, 4 and 5. All soil used to construct the CCL originated from an on-site borrow source located immediately west of PDP-5.

A professional engineer-certified Summary of Liner Construction Report was completed in September 2016 to document construction of the PDP-5 CCL in accordance with the requirements of § 257.71(b) and placed in the MLSES Facility operating record (B&M, 2016a). The Summary of Liner Construction Report for PDP-5 was included with the ALD Application submitted to USEPA in November 2020 (Golder, 2020a).

A professional engineer-certified Soil and Liner Evaluation Report (SLER) was prepared to document on-site inspection, field testing and laboratory testing during construction of the PDP-5 CCL (ETTL, 2011). The SLER concluded the following:

- The PDP-5 CCL was constructed to minimum thicknesses of 3 feet on the sides of the perimeter berms and 2 feet on the bottom of the pond as documented by instrument survey.

- All soil used to construct the CCL was documented to meet the following specifications:
  - Liquid Limit (LL): 30 or greater
  - Plasticity Index (PI):15 or greater
  - Percent Passing No. 200 Sieve: 30 Percent or greater
- The CCL was constructed in parallel, uniform lifts not exceeding nine inches loose, six inches compacted. Each lift was moisture conditioned and compacted to at least 95% of maximum dry density at or above optimum moisture content.
- In place moisture-density tests were performed at a rate of one test per 8,000 square feet for each compacted CCL lift with a nuclear gauge calibrated daily (ASTM D 2922). Approximately 300 tests were performed per liner lift or approximately 1,200 tests for the constructed 2-foot thick bottom CCL.
- Undisturbed CCL samples were collected and subjected to hydraulic conductivity testing (ASTM D 5084) at a rate of one test per 100,000 square feet for each CCL lift. Twenty-four (24) hydraulic conductivity tests were performed per liner lift or a total of ninety-six (96) hydraulic conductivity tests for the constructed 2-foot thick bottom CCL. All undisturbed CCL samples exhibited hydraulic conductivities of nor more than 1 X 10^{-7} cm/sec.

A copy of the SLER for PDP-5 was included with the ALD Application submitted to USEPA in November 2020 (Golder, 2020a).

2.0 CHARACTERIZATION OF SITE HYDROGEOLOGY - §257.71(d)(1)(ii)(A)

In accordance with § 257.71(d)(1)(ii)(A), characterization of the variability of site-specific soil and hydrogeology surrounding PDP-5 that will control the rate and direction of contaminant transport from the impoundment is presented in this section.

2.1 Hydraulic Conductivity of Uppermost Aquifer - § 257.71(d)(1)(ii)(A)(1)

Rising- and falling-head aquifer tests (slug tests) were conducted at three monitoring wells (PDP-22, PDP-25, and PDP-26) located along the perimeter of PDP-5 on October 7, 2015 to evaluate the hydraulic characteristics of the uppermost aquifer. Slug test data and time-head change plots were used to calculate hydraulic conductivities using the Bouwer-Rice solution (Bouwer and Rice 1976). Documentation on the slug test methods and data was presented in the Groundwater Monitoring System Certification for the Site (PBW 2017a). The arithmetic mean of the hydraulic conductivities from the slug-in and slug-out data is the representative hydraulic conductivity for each well. A geometric mean of the average hydraulic conductivities from the three wells was also calculated and is considered representative of the PDP 5 Area. The average hydraulic conductivities for the test wells were generally consistent, ranging from 2.48×10^{-5} cm/sec (well PDP-22) to 1.37×10^{-4} cm/sec (well PDP-25), with a geometric mean of 4.40×10^{-5} cm/sec.

2.2 Variability of Subsurface Soil Characteristics - § 257.71(d)(1)(ii)(A)(2)

Subsurface soil characteristics at PDP-5 were evaluated based on soil boring information gathered from the CCR monitoring wells that were installed around the perimeter of the unit. The soil borings ranged from approximately 25 to 95 feet below ground surface (bgs) and were all completed to depths that encountered the uppermost aquifer. Copies of the monitoring well boring logs are provided in Appendix A. Cross sections through PDP-5 developed using the geologic information from selected CCR monitoring wells are shown in Figures 3, 4 and 5.

The geologic units encountered during installation of the monitoring wells/soil borings in the vicinity of PDP-5 and in other historic soil borings completed in the area include:

- Zone 1: an upper sand unit observed on hilltops in the area;
- Zone 2: an intermediate continuous clay unit that contains discontinuous, interbedded sand layers; and
- Zone 3: a lower unit of silt and sand with some interbedded clay.

The geologic zones described above generally are laterally consistent across the Site. PDP-5 extends significantly above natural grade and represents a localized topographic high-point relative to the surrounding area. As a result, groundwater is mounded at PDP-5 and flows radially outward from the unit. The stratigraphic location of PDP-5 correlates with the upper hilltop sand unit (Zone 1). The uppermost aquifer at the Site occurs in the lower unit of silt and sand (Zone 3). The CCR monitoring wells are completed in the uppermost aquifer around the perimeter of PDP-5.

2.3 Sampling Methods Adequate to Characterize Subsurface Variability - § 257.71(d)(1)(ii)(A)(3)

The CCR monitoring wells were installed by a water-well driller licensed by the State of Texas using recognized drilling methods (sonic and hollow-stem auger drilling methods). Soil samples were collected continuously to the base of each monitoring well boring and lithologically logged in the field using the Unified Soil Classification System (USCS). All sampling and aquifer characterization methods used are in line with recognized and

generally accepted practices and provided data at a spatial resolution necessary to adequately characterize the variability of subsurface conditions that control contaminant transport. Appendix A presents the CCR monitoring well boring logs, which document the methods used to characterize subsurface soil conditions. The methods used to evaluate aquifer hydraulic characteristics are summarized in Section 2.1 and were discussed in detail in the Groundwater Monitoring System Certification for the Site (PBW 2017a).

2.4 Sample Locations Sufficient to Capture Subsurface Variability - § 257.71(d)(1)(ii)(A)(4)

All soil borings and monitoring wells used to characterize the hydrogeology of the PDP-5 area were completed to depths below the groundwater table and are sufficiently deep to evaluate the uppermost aquifer. As shown on Figure 1, PDP-5 is not located adjacent to a water body; consequently, § 257.71(d)(1)(ii)(A)(4)(ii) does not apply to PDP-5.

As shown on the cross sections provided on Figures 3, 4 and 5, the geology described in Section 2.2 is generally consistent across the Site. The PDP-5 area represents a localized topographic high-point from which groundwater flows radially outward in all directions, as is common in topographically high areas. As shown on Figure 2, nine monitoring wells (MW-17A, MW-18A, MW-19, MW-20A, PDP-22, PDP-23, PDP-24, PDP-25, PDP-26) are distributed radially along the perimeter of PDP-5 and are screened in the uppermost aquifer to capture groundwater flowing outward from the topographic high-point. The CCR monitoring wells were completed in zones with relatively high sand content, which biases the wells to locations with preferential flow pathways. Based on the soil and aquifer data gathered from the Site, the current CCR groundwater monitoring network adequately addresses subsurface variability at the Site.

2.5 Site Geological History - § 257.71(d)(1)(ii)(A)(5)

PDP-5 is located in the outcrop area of the Eocene-aged Wilcox Group, which regionally consists of interbedded sand, silt, clay, and lignite deposited in paleofluvial-deltaic channel complexes and interchannel flood basins (Barnes, 1965). Based on the CCR applicability study conducted by Burns and McDonnell (2015), PDP-5 is not located within a seismic impact zone or in an area with known faults. Coal ash surface impoundments have been operated in the vicinity of PDP-5 since 1979. PDP-5 was constructed in 2010 above grade and is surrounded by earthen embankments that extend approximately 10 to 15 feet above the adjacent ground surface; consequently, PDP-5 represents a localized topographic high-point relative to the surrounding area.

As described in Section 2.2 and shown on the geologic cross sections presented on Figures 3, 4 and 5, geology in the PDP-5 area consists of an upper sand unit, an intermediate continuous clay unit that contains discontinuous, interbedded sand layers, and a lower unit of silt and sand with some discontinuous, packages of interbedded clay.

The underlying closed former surface impoundments were primarily constructed within the upper hilltop sand unit and/or the confining intermediate clay unit below the hilltop sand unit. A small portion of the closed PDP units also appear to intersect the top of the uppermost aquifer in Zone 3 (Figure 4). The uppermost aquifer at PDP-5 occurs in the lower unit of silt and sand that contains discontinuous packages of interbedded clay. All PDP-5 CCR monitoring wells are screened in the uppermost aquifer and the screened intervals of the wells ensure detection of potential groundwater contamination in the uppermost aquifer from PDP-5.

2.6 Conceptual Site Model - § 257.71(d)(1)(ii)(A)(6)

The conceptual site model is depicted on Figures 3, 4, and 5. As discussed previously, PDP-5 extends

significantly above natural grade and represents a localized topographic high-point relative to the surrounding area. The stratigraphic location of PDP-5 correlates with the upper hilltop sand unit (Zone 1). The uppermost aquifer at the Site occurs in the lower unit of silt and sand (Zone 3), which is typically underlain by a clay unit around elevation 320 feet above mean sea level (amsl). The closed former surface impoundments that lie below PDP-5 (PDP-1, PDP-2, and PDP-3) were primarily constructed within the upper hilltop sand unit (Zone 1) and/or the confining intermediate clay unit below the hilltop sand unit (Zone 2). A small portion of the closed PDP units appear to intersect the top of the uppermost aquifer in Zone 3 (Figure 4). Groundwater flows radially outward from the topographic high-point at PDP-5 and the monitoring wells distributed radially along the perimeter of PDP-5 are adequate to ensure detection of potential groundwater contamination in the uppermost aquifer due to PDP-5.

2.7 Status of PDP-5 Detection Monitoring Program

Groundwater monitoring is performed at PDP-5 under a Detection Monitoring Program implemented in accordance with the requirements of § 257.94. The initial detection monitoring samples were collected in September 2017 and subsequent detection monitoring samples were collected on a semi-annual basis thereafter. The results from the 2017 through 2020 detection monitoring events were presented in the Annual Groundwater Monitoring and Corrective Action Reports for 2017 through 2020 (PBW, 2018b; Golder, 2019; Golder, 2020b; Golder, 2021).

Data collected as part of each monitoring event are evaluated using procedures described in the Statistical Analysis Plan (PBW, 2017b) to identify statistically significant increases (SSIs) of Appendix III parameters over background concentrations. An intrawell data evaluation approach is used to compare the sample data to historical data at each groundwater monitoring well independently based on the following:

- Groundwater is mounded at PDP-5 and flows radially outward from the unit. Based on the direction of groundwater flow, there are no upgradient areas in the vicinity of PDP-5 and all of the CCR monitoring wells are downgradient wells.
- Although PDP-5 was constructed in 2010, coal ash surface impoundments have been operated in the vicinity of PDP-5 since 1979. As a result, groundwater conditions in the vicinity of PDP-5 are influenced by the historical operations of the closed former surface impoundments in the area. Intrawell data evaluations allow for a comparison of water quality data in each well against background values established from that well's own historical water quality data, which takes into account potential effects of the closed former surface impoundments on groundwater in the area.
- Use of intrawell data evaluations complies with CCR Rule requirements as well as EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (EPA, 2009).

Table 1 shows the statistical background Appendix III constituent concentrations developed for each PDP-5 monitoring well and Table 2 summarizes the Appendix III concentrations reported in samples from the PDP-5 monitoring wells from 2017 through 2020.

Low concentrations of Appendix III constituents were reported in all wells from 2017 through 2020 (see Table 2) and SSIs were periodically identified for boron, calcium and/or chloride in wells PDP-23, PDP-25 and/or MW-20A due to the low statistical background concentrations calculated for the constituents in these wells. In accordance with § 257.94(e)(2), Alternate Source Demonstrations (ASDs) prepared each year for PDP-5 determined that the reported SSIs were attributed to natural variation in groundwater quality and the closed former non-CCR Rule regulated coal ash surface impoundments beneath/adjacent to PDP-5 (Golder, 2019; Golder, 2020b; Golder, 2021b). Detection monitoring performed to date at PDP-5 does not indicate evidence of a release of Appendix III constituents to groundwater.

3.0 GEOTECHNICAL TESTING TO CHARACTERIZE POTENTIAL FOR INFILTRATION THROUGH PDP-5 LINER - § 257.71(d)(1)(ii)(B)

PDP-5 is constructed with a CCL measuring 3 feet thick on the sides of the perimeter berms and 2 feet thick on the bottom of the impoundment. As specified in § 257.71(d)(1)(ii)(B), the potential for infiltration through the PDP-5 liner was evaluated using geotechnical laboratory testing of representative clay liner samples. The results of geotechnical laboratory testing to characterize the potential for infiltration through the PDP-5 liner is presented in this section.

3.1 PDP-5 Liner Testing Methodology

The potential for infiltration through the PDP-5 liner was evaluated using the following methodology:

- **Representative Sample of PDP-5 CCL**. A representative sample of the clay liner in PDP-5 was collected on September 17, 2021 for geotechnical analysis. PDP-5 is active and it is difficult to collect a representative sample of the CCL from PDP-5 while the impoundment is in service. However, as described in Sections 1 and 2 of this report, the CCL for PDP-5 extends beyond the perimeter berms of PDP-5.and serves as the low permeability clay cap for the closed PDP units upon which PDP-5 was constructed (PDP-1, 2 and 3). The clay cap outside of the PDP-5 berms consists of (from bottom to top):
  - 3 feet of compacted clay; and
  - 18 inches of vegetated soil.

  Since the same clay soil used to construct the PDP-5 CCL was used to construct the clay cap for the underlying closed impoundments beyond the perimeter berms of PDP-5, and the PDP-5 CCL and the clay cap are contiguous and were constructed as part of the same project, a representative sample of the clay cap for PDP-1, -2 and -3 outside of the PDP-5 berms is representative of the PDP-5 CCL.

  Figure 6 shows the location of the clay sample collected from the PDP-1, 2 and 3 cap. The sample was collected as follows:
  - Vegetated soil was excavated using a backhoe from an approximately 6 ft X 6 ft area to expose the surface of the underlying compacted clay layer. The excavated vegetated soil was temporarily stockpiled adjacent to the excavated area.
  - The upper 6 inches from the surface of the compacted clay layer was excavated using the backhoe and placed in the stockpiled vegetated soil area.
  - An additional 6 to 8 inches of the compacted clay layer was excavated using the backhoe to collect the clay samples. Two (2) 5-gallon buckets (approximately 1.5 cubic feet) of excavated clay were collected for laboratory testing.
  - After the clay sample was collected, granular bentonite was placed in the excavated section of the clay layer and leveled to match the top of the surrounding clay. Clean water was then sprayed/poured onto the bentonite to hydrate the bentonite.
  - After the bentonite was placed/hydrated, the stockpiled clay that was not included in the sample was placed over the bentonite and compacted/leveled.
  - The stockpiled vegetative soil was placed in the excavated area and the backfilled area graded to match adjacent areas. Rye grass seed was then spread over the backfilled area. The two 5-gallon buckets containing the clay sample were sealed prior to delivery to the geotechnical laboratory.
- **Representative Sample of PDP-5 Water**. Section 257.71(d)(1)(ii)(B)(2) specifies that the liquid used to pre-hydrate the soil samples and measure the hydraulic conductivity in the laboratory must reflect the pH

and major ion composition of the CCR surface impoundment porewater. To comply with this requirement, a representative sample of the water in PDP-5 was collected on September 17, 2021 for use in the geotechnical testing. Figure 6 shows the location of the PDP-5 water sample.

Water from PDP-5 was collected using a peristaltic pump fitted with disposable tubing. The intake of the tubing was placed in PDP-5 approximately 12 inches below the water surface. Approximately 5 gallons of water was collected and placed in a sealed 5-gallon bucket prior to delivery to the geotechnical laboratory.

- **Geotechnical Testing - Soil Classification**. The clay sample and PDP-5 water sample were transported to the Golder Geotechnical Laboratory located in Houston, Texas. Golder's geotechnical laboratory equipment is calibrated and certified at least once per year by independent agencies using standards traceable to the National Institute of Standards Technology (NIST). This includes all load frames, electronic balances, transducers, load cells, dial and digital gauges, and digital indicators. The laboratory also participates in the American Association of State Highways and Transportation Officials (AASHTO) soil proficiency sample program. The clay sample was tested using the following procedures to classify the soil:
  - Grain Size Distribution using ASTM D1140 - *Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing*;
  - Atterberg Limits using ASTM D4318 – *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*; and
  - Moisture-Density Relationship using ASTM D698 Method A – *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort*.

  The ASTM D1140 and D4318 testing results will be used to classify the soil in accordance with ASTM D2487 – *Standard Practice For Classification Of Soils For Engineering Purposes (Unified Soil Classification System)*. The ASTM D698 results were used to remold/recompact the clay sample prior to hydraulic conductivity testing.
- **Geotechnical Testing – Hydraulic Conductivity**. After the clay was classified and moisture-density relationships were documented, a sample of the clay was remolded and compacted to 95 percent density at 4 percent over optimum moisture content. The remolded sample was then tested for hydraulic conductivity using ASTM D7100 - *Standard Test Method for Hydraulic Conductivity Compatibility Testing of Soils with Aqueous Solutions,* with the following modifications:
  - Section 257.71(d)(1)(ii)(B)(2) specifies that the liquid used to pre-hydrate the soil samples and measure the hydraulic conductivity in the laboratory must reflect the pH and major ion composition of the CCR surface impoundment porewater. To comply with this requirement, the water collected from PDP-5 was used to pre-hydrate the remolded sample and used as the testing fluid during the hydraulic conductivity test.
  - Section 257.71(d)(1)(ii)(B)(4) specifies that the hydraulic conductivity test be performed until equilibrium has been achieved between the inflow and outflow, within acceptable tolerance limits, for both electrical conductivity and pH. To comply with this requirement, the ASTM D7100 testing apparatus was modified to include fluid bladders at the inlet and outlet of the testing cylinder to allow for collection and measurement of the electrical conductivity and pH of the fluid before passing through the clay sample and after passing through the clay sample (see photograph in Appendix B). The hydraulic conductivity test will be performed until the electrical conductivity and pH of the fluid before and after passing through the sample are approximately equivalent.

3.2 PDP-5 Liner Testing Results

Laboratory analytical reports from the geotechnical testing of the PDP-5 clay liner sample are attached in Appendix C. The results of the testing can be summarized as follows:

- Grain Size Distribution and Atterberg Limits – 62 percent of the sample was reported to be finer than a No. 200 sieve and the sample had a Liquid Limit (LL) of 34 and a Plasticity Index (PI) of 17. In accordance with ASTM D2487, the PDP-5 liner sample was classified as a sandy lean clay (CL).
- Moisture-Density – The maximum dry density of the sample was 110.9 pounds per cubic foot and the optimum water content was 15.8 percent.
- Hydraulic Conductivity – Hydraulic conductivity testing was initiated in October 2021 and is still underway. Test results collected thus far indicate that the hydraulic conductivity of the clay sample is below 1 X 10^{-7} cm/sec; however, to date, the electrical conductivity and pH of the fluid before and after passing through the sample have not achieved approximate equilibrium. The testing will continue until the designated criteria have been achieved and the results will be submitted to EPA under separate cover.

3.3 Comparison of Geotechnical Laboratory Testing Procedures to § 257.71(d)(1)(ii)(B) Requirements

The geotechnical laboratory testing performed on the PDP-5 CCL sample complies with the requirements of § 257.71(d)(1)(ii)(B) as follows:

- § 257.71(d)(1)(ii)(B)(1) - As described in Sections 1 and 2 of this report, the CCL for PDP-5 also serves as the low permeability clay cap for the closed PDP units upon which PDP-5 was constructed and the CCL extends beyond the perimeter berms of PDP-5. Since the same clay soil used to construct the PDP-5 CCL was used to construct the clay cap for the underlying closed impoundments beyond the perimeter berms of PDP-5 and the PDP-5 liner and the clay cap are contiguous and were constructed as part of the same project, a representative sample of the clay from the PDP-1, 2 and 3 cap outside the PDP-5 berms was collected for the laboratory testing. As described in Section 1.3, the PDP-5 CCL and clay cap were constructed using borrow soil from the same on-site borrow area and were subjected to extensive quality control/quality assurance testing during construction to ensure installation consistency and compliance with the design specifications. Based on these data, the clay sample subjected to the laboratory testing is representative of the PDP-5 CCL and is sufficient to capture the variability of saturated hydraulic conductivity for the liner.
- § 257.71(d)(1)(ii)(B)(2) - Section 257.71(d)(1)(ii)(B)(2) specifies that the liquid used to pre-hydrate the soil samples and measure the hydraulic conductivity in the laboratory must reflect the pH and major ion composition of the CCR surface impoundment porewater. A representative sample of the water in PDP-5 was used to perform the geotechnical laboratory hydraulic conductivity testing.
- § 257.71(d)(1)(ii)(B)(3) – The PDP-5 CCL is a mechanically compacted, constructed liner and naturally occurring soils are not part of the liner system. As a result, this criterion does not apply to the PDP-5 liner testing program.
- § 257.71(d)(1)(ii)(B)(4) – Section 257.71(d)(1)(ii)(B)(4) specifies that the hydraulic conductivity test be performed until equilibrium has been achieved between the inflow and outflow, within acceptable tolerance limits, for both electrical conductivity and pH. To comply with this requirement, the ASTM D7100 testing apparatus was modified to include fluid bladders at the inlet and outlet of the testing cylinder to allow for collection and measurement of the electrical conductivity and pH of the fluid before passing through the clay sample and after passing through the clay sample. Hydraulic conductivity testing was initiated in October 2021 and is still underway. Test results collected thus far indicate that the hydraulic conductivity of the clay sample is below 1 X 10^{-7} cm/sec; however, to date, the electrical conductivity and pH of the fluid before and after passing through the sample have not achieved approximate equilibrium. The testing will continue until the designated criteria have been achieved.

4.0 MATHEMATICAL MODELING TO ESTIMATE POTENTIAL EFFECTS OF INFILTRATION THROUGH PDP-5 LINER - § 257.71(d)(1)(ii)(C)

Section 257.71(d)(1)(ii)(C) specifies that a mathematical model be used to evaluate the potential effects of infiltration of Appendix IV constituents through an impoundment liner on groundwater conditions in the vicinity of the impoundment. Mathematical modeling to assess the potential effects of Appendix IV constituents infiltrating through the PDP-5 CCL liner on underlying groundwater was performed as follows:

- A representative sample of the water in PDP-5 was collected and analyzed for Appendix IV constituents and general chemistry to establish site-specific characteristics of the water in the impoundment that could potentially infiltrate through the CCL.
- A representative sample of the PDP-5 CCL was collected and analyzed for total aluminum, total iron and cation exchange capacity (CEC) to establish site-specific CCL characteristics for use in the model.
- Geochemical modeling was conducted to evaluate the potential transport of Appendix IV constituents in the PDP-5 water infiltrating through the PDP-5 CCL.
- Additional geochemical modeling was conducted using national-scale data for Appendix IV constituent concentrations sourced from the existing EPA risk record as stipulated in § 257.71(d)(1)(ii)(C) to evaluate the potential transport of Appendix IV constituents infiltrating through the PDP-5 CCL under simulated, hypothetical worst-case conditions.
- Liner breakthrough concentrations of Appendix IV constituents under the site-specific and worst-case simulated infiltration scenarios were compared to groundwater protection standards (GWPS) for each constituent. If the modeled liner breakthrough concentration was less than the GWPS, no adverse effect on underlying groundwater was indicated and the existing PDP-5 CCL was deemed to be protective of underlying groundwater for that constituent.
- If the modeled PDP-5 liner breakthrough concentration was greater than the GWPS, the mass flux of the breakthrough constituent through the liner was calculated and compared to the estimated mass of that constituent that exists in the large volume of coal ash contained in the closed in-place, underlying former PDP-1, -2 and -3 impoundments. As described earlier in this report, PDP-5 is constructed on top of closed former ash impoundments PDP-1, -2 and -3 and any fluid that infiltrates through the PDP-5 liner will pass into the underlying former impoundments. The ash present in the underlying former impoundments contains the same Appendix IV constituents that are present in the CCR stored in PDP-5. If the mass flux of a breakthrough Appendix IV constituent through the PDP-5 CCL represents only a small fraction of the mass of that same constituent present in the underlying closed former impoundments, the incremental risk to groundwater posed by the potential infiltration of that constituent through the PDP-5 CCL is negligible.

The results of mathematical modeling to assess the potential effects of Appendix IV constituents infiltrating through the PDP-5 CCL liner on underlying groundwater are presented in this section.

4.1 Data Assumptions for PDP-5 Liner Infiltration Modeling

The following site-specific and publicly available data were used to perform the mathematical modeling of the potential effects of infiltration through the PDP-5 liner:

- PDP-5 Water. A representative sample of the water in PDP-5 was collected on October 28, 2021 and submitted to DHL Analytical of Round Rock, Texas for laboratory analysis. The PDP-5 water sample was collected from approximately the same location as the water sample previously collect in September 2021 for use in the geotechnical testing described in Section 3.0 of this report (see Figure 6). A sample collection form for the PDP-5 water sample is reproduced in Appendix D. Due to high turbidity observed in the PDP-5 surface water during the sampling (up to 1,000 NTU), the sample was collected in

unpreserved containers and filtered at the laboratory using a 0.45 micron filter prior to preservation and analysis.

The PDP-5 water sample was analyzed for the following constituents:

- Appendix IV Constituents:
  - Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Lead, Lithium, Mercury, Molybdenum, Selenium and Thallium using EPA Methods SW6020B and SW7407A;
  - Fluoride using EPA Method E300; and
  - Radium 226 and 228 using Standard Method SM7500Ra-B M and EPA Method 904/9320.
- Appendix III and General Chemistry Parameters:
  - Boron, Calcium, Magnesium, Potassium and Sodium using EPA Method SW6020B;
  - Chloride, Sulfate, and Fluoride using EPA Method E300;
  - Total Dissolved Solids (TDS) using Method M2540C;
  - pH using Method M4500; and
  - Alkalinity using Method M2320B.

Sampling results for the PDP-5 water sample are summarized in Tables 3 and 4 and laboratory reports are reproduced in Appendix D. It should be noted that radium 226 and 228 concentrations in the PDP-5 water sample were not available prior to the date of this report. As a result, a total radium concentration of 5 pCi/L (the GWPS for radium) was assumed to be present in the PDP-5 water for mathematical modeling of the potential effects of infiltration through the PDP-5 CCL. It is anticipated that the actual PDP-5 pond water radium concentration is significantly less than the assumed 5 pCi/L value, since the total radium concentration in a similar pond water sample collected from the MLSES East Ash Pond was 0.337 pCi/L. The geochemical model will be updated once the PDP-5 water sample radium results have been received and the updated model results will be submitted to EPA under separate cover.

- PDP-5 CCL. A representative sample of the clay liner in PDP-5 was also collected on September 17, 2021 for chemical analysis to evaluate the attenuation capacity of the clay as part of the mathematical modeling. The tests included:
  - Total metals (Iron and Aluminum): This test was used to quantify the iron and aluminum present in the PDP-5 CCL. The total mass of iron and aluminum was used to determine the density of adsorption sites available for attenuation based on a Surface Complexation Model (described in Section 4.2). Total iron and aluminum were analyzed using EPA Method SW6010C.
  - Cation exchange capacity (CEC): The CEC represents the total number of negative charge sites in a given amount of solid at which reversible cation adsorption and desorption can occur (Hem 1985). The CEC of a material also commonly refers to the replacement of one cation by another in a selective series or preferred adsorption. In this case, the sorption selectivity increases with the ionic radius of the ion, for instance in the following series: $K^+ > Na^+ > Li^+ > Ba^{2+} > Sr^{2+} > Ca^{2+} > Mg^{2+}$ (Smith 1999). This information is used for geochemical modeling as the release or attenuation of many trace metals is affected by the CEC of soil in the aquifer. The laboratory analyzed the CEC of soil samples using method USEPA SW9081.

    Laboratory reports are reproduced in Appendix E.
- EPA Risk Record Data. Section 257.71(d)(1)(ii)(C) stipulates that national-scale data for Appendix IV constituent concentrations sourced from the existing EPA risk record be considered in the evaluation. Data from EPA's *Human and Ecological Risk Assessment of Coal Combustion Residuals* (EPA, 2014)

was used to evaluate the potential transport of Appendix IV constituents infiltrating through the PDP-5 CCL under simulated, worst-case conditions. Table 3-1 from the EPA document showing 90th percentile Impoundment Porewater, Wastewater and Whole Waste concentrations for Appendix IV and other constituents is reproduced in Appendix F. It should be noted that the EPA 90th percentile Impoundment Porewater Appendix III and Appendix IV concentrations are significantly higher than the actual PDP-5 water Appendix III and Appendix IV concentrations as shown in Tables 5 and 6.

- Hydraulic Flux Through PDP-5 CCL. The rate of fluid seepage (hydraulic flux) through the PDP-5 CCL is an important data input for the geochemical model. The hydraulic flux through the PDP-5 liner was estimated using the following modified Darcy Equation:

  $V = k * ((H+d)/d)$

  where: V = hydraulic flux through CCL
  k = hydraulic conductivity of the CCL
  H = vertical distance measured between the top of the CCL and the water surface in PDP-5
  d = thickness of the CCL

  The following site-specific values were used to calculate the hydraulic flux through the PDP-5 CCL:

  $k = 1 \times 10^{-7}$ cm/sec
  H = 11 feet (PDP-5 operating level of El. 403.5 minus the top of liner elevation at the interior toe of the perimeter dike (El. 392.5) as shown on Figures 4 and 5.
  d = 2 feet

  Plugging these values into the above equation, the hydraulic flux through the PDP-5 CCL is estimated to be 6.5×10^{-7} cm/sec or approximately 0.67 feet/year.

- Model Duration. The Infiltration models were run for a period of 50 years. The modeling period is assumed to begin when the PDP-5 CCL was constructed (2010), so the duration of the model extends until approximately 2060. This time frame is conservatively assumed to exceed the projected active life of PDP-5.

4.2 Geochemical (Mathematical) Modeling of the PDP-5 Liner

Geochemical modeling was conducted to evaluate the potential transport of the Appendix IV constituents through the PDP-5 CCL. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC, was used for these simulations (Parkhurst and Appelo 2013). PHREEQC version 3.6 is a free, publicly available general-purpose model that is well established in academia and accepted by federal agencies and laboratories and the model can be used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). PHREEQC is capable of 1-dimensional reactive transport, and can incorporate reactions that include aqueous equilibria, mineral dissolution and precipitation, cation and ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely accepted thermodynamic database included with PHREEQC, Minteq.v4, 2021 edition (USEPA 1998, as amended), was used as a basis for the thermodynamic constants required for modeling, with additions from recent literature as required.

4.2.1 Adsorption (Surface Complexation)

Adsorption is an important mechanism by which constituents can be attenuated as they flow through the PDP-5 CCL. The adsorptive partitioning between dissolved and solid phases for this model was simulated using a two-layer surface complexation model (SCM). The SCM approach is described in Davis and Kent (1990), with additional parameterization based on Dzombak and Morel (1990) and Karamalidis and Dzombak (2010) utilizing

iron (hydrous ferric oxide [Hfo]) as ferrihydrite [$Fe(OH)_{3(am)}$], and aluminum (hydrous aluminum oxide [Hao]) as gibbsite [$Al(OH)_{3(am)}$], as adsorbing surfaces.

The amounts of Hfo and Hao available in the PDP-5 CCL material for attenuation were measured using a total extraction and is quantified in Table 7. The Hfo and Hao surface properties (i.e., surface area, site density, and types of sites) were calculated based on guidance from Dzombak and Morel (1990) and Karamalidis and Dzombak (2010) to quantify the iron and aluminum adsorption sites per mole of mineral.

The calculation methodology of Appelo and Postma (2010) was used to determine the specific quantity of sites on each mineral surface type as a function of the amount of mineral available to participate in these reactions. The methodology assumes the number of surface sites (sites) equals the product of the moles of iron ([Fe]) and the moles of surface sites per mole of iron ([sites]/[Fe]= 0.2 moles of sites per mole of iron). For the amount of ferrihydrite available for sorption, the Appelo and Postma methodology further assumes the mass of ferrihydrite (m_{Hfo}) in grams (g) available equals the product of the [Fe] and the molecular weight of ferrihydrite (m_{wHfo} = 88.85 g/mole). The same approach was used to calculate the number of sites from gibbsite, assuming the [sites]/[Al] is 0.41 moles of sites per mole of aluminum and the molecular weight of gibbsite is 78.003 g/mole.

The geochemical thermodynamic database Minteq V.4 was used to conduct adsorption modeling. However, new and updated thermodynamic data have been released in scientific literature. These new data are important to include in the geochemical modeling exercises for certain elements or minerals as they allow further refinement of potential reactions, or for correction of previous data that may have been less accurate or more broadly defined. For groundwater modeling at the Site, Golder made numerous updates to the Minteq V.4 database, including the addition of data relating to partitioning coefficients for metals on gibbsite, developed by Karamalidis and Dzombak (2010). Of the two constituents of interest, the database did not contain partitioning coefficients for ferrihydrite or gibbsite for lithium, so its potential for adsorption could not be assessed using this method. Instead, lithium was modeled using the CEC as described in Section 4.1.

Table 7: Surface Site Calculations for PDP-5 Liner Based on Measured Iron and Aluminium in Sample

Parameter	Unit	Ferrihydrite	Gibbsite
PDP-5 Solids Composition	mg/kg	18,500	13,200
	mmol	331.3	489.22
	mol	3.31E-01	4.89-E01
Surface Site Concentration	mol weak sites / mol	0.2	0.41*
	mol strong sites / mol	0.005	
Surface Sites	mol weak	6.6E-02	2.0E-01*
	mol strong	1.7E-03	
Mass of Ferrihydrite or Gibbsite	grams	29.4	38.2

Note: Gibbsite in the Karamalidis and Dzombak (2010) adsorption model has a single surface site type and is note specified as strong or weak sites.

4.2.2 Cation Exchange

To quantify the CEC, a generalized CEC model was used in PHREEQC. The CEC represents the total number of negative charge sites in a given amount of solid at which reversible cation adsorption and desorption can occur (Hem 1985). Cation exchange also commonly refers to the replacement of one cation by another in a selective series or preferred adsorption. In this case, the sorption selectivity increases with the ionic radius of the ion, for instance in the following series: $K^+ > Na^+ > Li^+ > Ba^{2+} > Sr^{2+} > Ca^{2+} > Mg^{2+}$ (Smith 1999). For modeling purposes, the number of sites can be calculated using Equation 1 (Breeuwsma et al. 1986):

$$X^-(\text{sites}) = \text{CEC}/(100/sw)(n/(1-n)) \quad \text{(Equation 1)}$$

where *sw* is the bulk density of the soil matrix, and *n* is the porosity.

For attenuation modeling for the PDP-5 CCL, a direct measurement of the CEC in the CCL by a certified laboratory was utilized (see Appendix E). The resulting value, 14.9 meq/100g of soil equated to 0.92 moles of exchange sites used in PHREEQC for 1-D reactive transport modeling.

4.2.3 Geochemical Modeling Approach

Two 1-D reactive transport model scenarios were evaluated to assess potential infiltration through the PDP-5 CCL as part of this ALD:

- Scenario 1 – PDP-5 Water (Actual Conditions). Modeling was conducted to evaluate the potential transport of Appendix IV constituents infiltrating through the PDP-5 CCL using source concentrations from a representative sample of PDP-5 water.
- Scenario 2 – EPA Risk Record Data (Hypothetical Worst-Case Scenario). Section 257.71(d)(1)(ii)(C) stipulates that national-scale data for Appendix IV constituent concentrations sourced from the existing EPA risk record be considered in the evaluation. Under this scenario, modeling was conducted to evaluate the potential transport of Appendix IV constituents infiltrating through the PDP-5 CCL using source concentrations based on the 90th percentile pore water concentrations as listed in EPA's Human and Ecological Risk Assessment of Coal Combustion Residuals document to simulate a hypothetical worst case scenario since the EPA 90th percentile concentrations are significantly higher than the actual PDP-5 water concentrations modeled under Scenario 1.

Modeling under both scenarios included an initial pre-equilibration of the PDP-5 CCL with background groundwater data from the Site to equilibrate the surface SCM sites and CEC sites to native background conditions and prevent over attenuation. The pre-equilibrium step was used to simulate the condition of the CCL at the start of PDP-5 operations, since a "clean surface" of the clay without the pre-equilibrium step would not provide an accurate representation of actual CCL attenuation capacity as no clay has "clean" surface sites in nature. PDP-5 water (Scenario 1) and the 90th percentile Impoundment Porewater (Scenario 2) was then fluxed through the PDP-5 CCL using 1-dimensional reactive transport to determine the time of breakthrough, the resulting concentrations of App. IV constituents in the respective eluents after transport, and the attenuation capacity of the PDP-5 CCL for each App. IV metal.

4.2.4 Geochemical Modeling Assumptions and Data Handling

Assumptions related to data handling practices and geochemical modeling were as follows:

- PDP-5 water chemistry: For geochemical modeling of Scenario 1, a sample with a full suite of parameters as described in Section 4.1 were used in this assessment (including standard groundwater cations and anions,

App. III and App. IV metals, pH, and redox). The resulting data are assumed to provide a comprehensive overview of the PDP-5 water at the site.

- Background groundwater chemistry: Groundwater is mounded at PDP-5 and flows radially outward from the unit and all of the PDP-5 CCR monitoring wells are therefore downgradient wells. Prior to the start of PDP-5 operation and exposure to CCR, the PDP-5 CCL exhibited an initial natural geochemical condition that is reflected at the start of the model. Since there are no upgradient/background monitoring wells at PDP-5, data from a groundwater sample collected from another location at the MLSES (Well H-27) were assumed to represent natural background conditions for the purpose of geochemical and predictive modeling (see Appendix G).
- National scale chemistry (EPA 90th percentile impoundment porewater): A representative leachate sample was used as a source of flux for scenario 2, that was developed per Section 4.1. Table 3-1 from the EPA document showing "90th Percentile Impoundment Porewater, Wastewater and Whole Waste Concentrations" for Appendix IV and other constituents is reproduced in Appendix F
- Liner thickness and flux rate: For modeling, the CCL thickness was held constant at two feet (the bottom thickness) and the hydraulic flux rate was held constant at 0.67 feet/ year (see Section 4.1).
- Non-detect values: Constituents with concentrations less than their respective method detection limits were assumed to have a concentration equal to ½ the reporting limit in model simulations. For equilibrium of the PDP-5 CCL for purposes of "pre-loading" the surfaces, an equivalent of the background groundwater sample was equilibrated with the PDP-5 CCL that only included actual detected parameters.
- Charge balance: Water compositions for modeling all had a charge balance errors less than 10%.

4.2.5 Geochemical Modeling Results

The results of the 1-dimensional geochemical reactive transport modeling of the two scenarios are provided in Table 8. Table 8 includes the peak concentration of each Appendix IV constituent and the corresponding GWPS expected over the 50-year model timeframe (starting when the PDP-5 CCL was constructed in 2010 and extending until approximately 2060). Figures 7-14 show the expected Appendix IV metal expected concentrations in the water that infiltrates through the CCL over the 50 years modeling period.

- Scenario 1 - PDP-5 Water (Actual Conditions): The results of 1-D reactive transport modeling indicated that within the 50-year modeling period, it is predicted that lithium is the only App. IV constituent that will exceed the GWPS after PDP-5 water infiltrates through the CCL. Lithium, a monovalent cation has a low affinity for adsorption, and can be replaced in the liner by other monovalent cations as PDP-5 water passes through (Section 4.2.2). The expected maximum lithium concentration that will occur on the exterior of the PDP-5 CCL is 0.229 mg/L, which is slightly higher than that of PDP-5 water due to the CEC pre-equilibration process. The conservative case modeled causes the pre-equilibrated PDP-CCL to release a slight amount of background lithium as it is replaced by a stronger PDP-5 solution that has a higher ionic strength and greater cation content than that of the background equilibration water. No other App. IV parameters are expected to exceed the GWPS following infiltration through the PDP-5 CCL.
- Scenario 2 - EPA Risk Record Data (Hypothetical Worst-Case Scenario): The results of 1-D transport modeling using the hypothetical EPA 90th percentile pore water concentrations indicated that within the 50-year modeling period, breakthroughs above the GWPS for only antimony (0.04 mg/l), lithium (0.45 mg/L), and thallium (0.003 mg/L) were identified. Thallium levels exceeded the GWPS by only 0.001 mg/L.

  Thallium, which also speciates as a monovalent cation in groundwater has a breakthrough similar to that of lithium and does not consider CEC in our model due to lack of reliable thermodynamic data. Therefore, thallium is essentially a conservative tracer in the models and achieves the same level outside the PDP-5 CCL as that of 90th percentile porewater (which is 4 times that of PDP-5 water).

Lithium breakthrough occurs at a level and time frame that is expected (~5 years) and continues to climb towards the porewater concentration input into the model. Note that due to the different water type and much higher lithium concentration in the 90th percentile porewater, background lithium is not released from the PDP-5 liner but rather levels continue to climb towards full strength as CEC is depleted.

Antimony breakthrough is modeled to occur quickly and achieve 90th percentile porewater concentrations through the PDP-5 CCL rapidly. However, for context, the 90th percentile porewater antimony was 12 times higher than that of what was measured in PDP-5 water. In native aquifer materials, antimony will likely attenuate quickly as it has a known affinity to adsorb to both Hfo and Hao when it is complexed as $Sb(OH)_4^-$ or $Sb(OH)_6^-$ at moderately oxidizing circum-neutral groundwater conditions. Additionally, the mineral SbO_2 was identified by modeling to be saturated (SI>0), and therefore while not simulated as part of this evaluation, antimony precipitation is favorable.

Based on the 1-D geochemical reactive transport modeling, breakthrough concentrations above GWPS of the following Appendix IV constituents were identified for each Scenario:

- Scenario 1 - PDP-5 Water (Actual Conditions):
  - Lithium - 0.229 mg/L
- Scenario 2 - EPA Risk Record Data (Hypothetical Worst-Case Scenario):
  - Lithium - 0.45 mg/L
  - Antimony - 0.04 mg/l
  - Thallium - 0.003 mg/L

Modeled CCL breakthrough concentrations for all other Appendix IV constituents under both scenarios were less than GWPS; consequently, no adverse effects on underlying groundwater from the other Appendix IV constituents were indicated and the PDP-5 CCL was deemed to be protective of underlying groundwater for these constituents.

4.2.6 Potential Effects of CCL Infiltration Breakthrough Concentrations Above GWPS on Site Groundwater

As described earlier in this report, PDP-5 was constructed on top of closed in-place, former ash impoundments PDP-1, -2 and -3 that historically received wastewater streams and solids similar to those currently managed in PDP-5. The lateral extent of PDP-5 is wholly contained within the boundaries of the underlying closed PDP-1, -2 and -3 and any fluid that infiltrates through the PDP-5 CCL will pass into the underlying former impoundments. Based on the operating history of PDP-1, -2 and -3, the ash present in the underlying former impoundments likely contains the same Appendix IV constituents that are present in the CCR managed in PDP-5.

To assess the incremental risk to Site groundwater posed by the modeled infiltration of the Appendix IV constituents that breakthrough through the PDP-5 CCL at concentrations greater than GWPS compared to the mass of those constituents already present in the underlying closed impoundments, the annual mass flux of the breakthrough constituents through the PDP-5 CCL was compared to the estimated mass of the same constituents present in the underlying closed former impoundments. This was accomplished based on the following assumptions:

- Surface Area of PDP-5. The surface area of PDP-5 is approximately 40 acres based on an AutoCAD Civil 3D measurement of the PDP-5 perimeter berms as documented in the PDP-5 as-built drawings (B&M, 2016b).

- Hydraulic Flux Through PDP-5 CCL. The rate of fluid seepage (hydraulic flux) through the PDP-5 CCL is used to estimate the mass flux of an Appendix IV constituent through the PDP-5 liner. As discussed earlier in this document, the hydraulic flux through the PDP-5 CCL is estimated to be 6.5 X 10^{-7} cm/sec or approximately 0.67 feet/year.

- Volume of Ash in Closed PDP-1, -2 and -3. The volume of ash present in the closed PDP-1, -2 and -3 impoundments beneath PDP-5 is approximately 1,920,000 CY based on a AutoCAD Civil 3D measurement of the approximate extent of PDP-1, -2 and -3 and the approximate thickness of solids in the impoundments at the time PDP-5 was constructed.

- Mass of Ash in Closed PDP-1, -2 and -3. PDP-1, PDP-2 and PDP-3 historically received wastewater streams and solids similar to those currently managed in PDP-5. Consequently, the ash solids present in the underlying closed impoundments are assumed to consist primarily of scrubber gypsum and bottom ash.

  Published dry unit weights of scrubber gypsum range from 60 to 65 pounds per cubic ft (lb/cf) and bottom ash range from 45 to 100 lb/cf (RMRC, 2021). For the purposes of this evaluation, an average unit weight of 80 lb/cf was assumed for the ash contained in the closed PDP-1, -2 and -3 impoundments.

  Based on an estimated volume of 1,920,000 CY and an assumed average ash unit weight of 80 lb/cf, approximately 4.15 X 10^{9} lbs (2,073,000 tons) of ash is estimated to be contained in the closed PDP-1, -2 and -3 impoundments beneath PDP-5.

- Concentrations of Target Appendix IV Constituents in Closed PDP-1, -2 and -3. PDP-1, PDP-2 and PDP-3 historically received wastewater streams and solids similar to those currently managed in PDP-5. Consequently, the ash present in the underlying former impoundments is assumed to contain similar Appendix IV constituents to those present in the CCR stored in PDP-5.

  The following 90th percentile Whole Waste concentrations from EPA's Human and Ecological Risk Assessment of Coal Combustion Residuals (EPA, 2014) were used to estimate the concentrations of antimony and thallium present in the ash in closed PDP-1, -2 and -3 (see Appendix F):

  - Antimony: 47.0 mg/Kg
  - Thallium: 33.9 mg/Kg

  A 90th percentile Whole Waste concentration for lithium is not included in the 2014 EPA document. The following lithium concentrations were reported for coal ash samples in publicly available documents:

  - 24.6 mg/Kg (Ruhl, et.al., 2009)
  - 48 mg/Kg (TDH, 2010)

  Based on these data, the concentration of lithium present in the ash in closed PDP-1, -2 and -3 was estimated to be 24.6 mg/Kg.

- Mass of Target Appendix IV Constituents in Closed PDP-1, -2 and -3. The mass of lithium, antimony and thallium present in the ash in the closed PDP-1, -2 and -3 was estimated by multiplying the estimated mass of ash in the underlying impoundments (2,073,000 tons) by the above estimated concentration of each constituent:

  - Lithium: 102,021 lbs
  - Antimony: 194,918 lbs
  - Thallium: 140,590 lbs

Tables 9 and 10 compare the estimated annual mass flux of the breakthrough constituents at concentrations above GWPS through the PDP-5 CCL to the estimated mass of the same constituents present in the underlying

closed former impoundments for Scenario 1 - PDP-5 Water (Actual Conditions) and Scenario 2 - EPA Risk Record Data (Hypothetical Worst-Case Scenario):

- Scenario 1 - PDP-5 Water (Actual Conditions). The annual mass flux of lithium through the PDP-5 CCL (16.7 lb/yr) represents only a small fraction (less than 0.02 percent) of the estimated mass of lithium present in the underlying closed former impoundments; consequently, the incremental risk to Site groundwater posed by potential infiltration of lithium through the PDP-5 CCL is negligible compared to the mass of lithium already present in the underlying impoundments. The PDP-5 CCL is therefore deemed to be protective of underlying groundwater under this scenario.
- Scenario 2 - EPA Risk Record Data (Hypothetical Worst-Case Scenario). The annual mass fluxes of lithium, antimony and thallium through the PDP-5 CCL (32.9 lb/yr, 2.9 lb/yr and 0.25 lb/yr, respectively) represent only a small fraction (approximately 0.03 percent for lithium and less than 0.01 percent for antimony and thallium) of the estimated mass of lithium, antimony and thallium present in the underlying closed former impoundments; consequently, the incremental risk to Site groundwater posed by potential infiltration of lithium, antimony and thallium through the PDP-5 CCL is negligible compared to the mass of these constituents already present in the underlying impoundments. The PDP-5 CCL was therefore deemed to be protective of underlying groundwater under this hypothetical worst-case scenario.

5.0 CONCLUSIONS

This Alternate Liner Demonstration confirms that there is no reasonable probability that operation of PDP-5 will result in concentrations of Appendix IV constituents in the uppermost aquifer at levels above groundwater protection standards beyond the boundaries of PDP-5. This conclusion is supported by the following:

- PDP-5 was constructed in 2010 with a compacted clay liner (CCL) measuring 3 feet thick on the sides of the perimeter berms and 2 feet thick on the bottom of the impoundment. Extensive construction QA documentation confirmed that the constructed CCL exhibited a hydraulic conductivity of no more than 1 X 10^{-7} cm/sec.
- PDP-5 was constructed on top of three closed in-place, non-CCR Rule regulated, former coal ash surface impoundments (PDP-1, PDP-2 and PDP-3) that began operation in 1979. The boundaries of the closed PDP-1, -2 and -3 extend beyond the boundaries of PDP-5 and any fluid that infiltrates through the PDP-5 CCL will pass into the underlying former impoundments. Based on the operating history of PDP-1, -2 and -3, the ash present in the underlying former impoundments likely contains similar Appendix IV constituents to those present in the CCR managed in PDP-5.
- Groundwater monitoring is performed at PDP-5 under a Detection Monitoring Program implemented in accordance with the requirements of § 257.94. From 2017 through 2020, SSIs were periodically identified for boron, calcium and/or chloride in selected monitoring wells; however, ASDs prepared each year determined that the reported SSIs were attributed to natural variation in groundwater quality and the closed former coal ash impoundments beneath/adjacent to PDP-5. Detection monitoring performed from 2017 through 2020 has not indicated evidence of a release of Appendix III constituents to groundwater from PDP-5.
- As specified in § 257.71(d)(1)(ii)(B), the potential for infiltration through the PDP-5 CCL was evaluated using geotechnical laboratory testing of a representative clay liner sample. Water collected from PDP-5 was used to pre-hydrate the clay liner sample and measure the hydraulic conductivity in the laboratory. Section 257.71(d)(1)(ii)(B)(4) specifies that the hydraulic conductivity test be performed until equilibrium has been achieved between the inflow and outflow of the testing apparatus for electrical conductivity and pH. Hydraulic conductivity testing is underway and test results collected thus far indicate that the hydraulic conductivity of the clay sample is below 1 X 10^{-7} cm/sec; however, the electrical conductivity and pH of the fluid before and after passing through the sample have not achieved approximate equilibrium. The testing will continue until the designated criteria have been achieved and the final results will be submitted to EPA under separate cover.
- In accordance with § 257.71(d)(1)(ii)(C), the USGS PHREEQC geochemical model was used to evaluate the potential transport of Appendix IV constituents through the PDP-5 CCL. Liner breakthrough concentrations of Appendix IV constituents from the model were compared to groundwater protection standards (GWPS) for each constituent. The infiltration models were run for a period of 50 years, with the modeling period beginning when the PDP-5 CCL was constructed (2010) and extending until approximately 2060 which conservatively exceeds the projected active life of PDP-5. Two PDP-5 operating scenarios were evaluated using the geochemical model:
  - Scenario 1 – PDP-5 Water (Actual Conditions). Modeling was conducted to evaluate the potential transport of Appendix IV constituents infiltrating through the PDP-5 CCL using source concentrations from a representative sample of PDP-5 water. Modeling of this scenario concluded that CCL breakthrough concentrations for all Appendix IV constituents except for lithium were less than GWPS and the PDP-5 CCL was therefore deemed to be protective of underlying groundwater for these constituents.

    Since the modeled lithium breakthrough concentration was greater than the GWPS, the annual mass flux of lithium through the PDP-5 CCL was compared to the estimated mass of lithium present in the coal ash contained in the closed underlying former PDP-1, -2 and -3 impoundments. The annual mass flux of lithium through the PDP-5 CCL represents only a small fraction (less than 0.02 percent) of the

estimated mass of lithium present in the underlying closed former impoundments; consequently, the incremental risk to groundwater posed by potential infiltration of lithium through the PDP-5 CCL is negligible. The PDP-5 CCL was therefore deemed to be protective of underlying groundwater under this scenario.

- Scenario 2 – EPA Risk Record Data (Hypothetical Worst-Case Scenario). Section 257.71(d)(1)(ii)(C) stipulates that national-scale data for Appendix IV constituent concentrations sourced from the existing EPA risk record be considered in the evaluation. Under this scenario, modeling was conducted to evaluate the potential transport of Appendix IV constituents infiltrating through the PDP-5 CCL using source concentrations based on the 90th percentile pore water concentrations as listed in EPA's Human and Ecological Risk Assessment of Coal Combustion Residuals document to simulate a hypothetical worst case scenario since the EPA 90th percentile concentrations are significantly higher than the actual PDP-5 water concentrations modeled under Scenario 1. Modeling of this worst-case scenario concluded that CCL breakthrough concentrations for all Appendix IV constituents except for lithium, antimony and thallium were less than GWPS and the PDP-5 CCL was therefore deemed to be protective of underlying groundwater for these constituents.

  Since the modeled lithium, antimony and thallium breakthrough concentrations were greater than the GWPS, the annual mass flux of lithium, antimony and thallium through the PDP-5 CCL was compared to the estimated mass of lithium, antimony and thallium present in the coal ash contained in the closed underlying former PDP-1, -2 and -3 impoundments. The annual mass flux of lithium, antimony and thallium through the PDP-5 CCL represents only a small fraction (approximately 0.03 percent for lithium and less than 0.01 percent for antimony and thallium) of the estimated mass of lithium, antimony and thallium present in the underlying closed former impoundments; consequently, the incremental risk to groundwater posed by potential infiltration of lithium, antimony and thallium through the PDP-5 CCL is negligible. The PDP-5 CCL was therefore deemed to be protective of underlying groundwater under this hypothetical worst-case scenario.

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TABLES

TABLE 1
STATISTICAL BACKGROUND VALUES FOR APPENDIX III CONSTITUENTS
PDP 5 DETECTION MONITORING PROGRAM

Sample Location	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Flouride (mg/L)	field pH (s.u.)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
MW-17A	0.538	6.73	10.4	0.4	2.5 9.19	51.9	170
MW-18A	0.20	3.1	10.4	0.4	4.88 7.92	9.1	157
MW-19	0.782	237	57.7	0.512	4.6 8.08	672	1,380
MW-20A	0.213	25.7	12.3	0.954	3.06 8.76	148	381
PDP-22	0.411	306	32.7	1.07	4.08 8.63	216	1,780
PDP-23	0.0678	2	7.52	0.4	3.38 8.45	3.27	143
PDP-24	4.92	45.9	22.6	1.03	1.33 9.97	533	894
PDP-25	0.136	41.3	197	0.4	4.65 7.93	118	705
PDP-26	0.111	4.74	14.6	0.577	5.35 7.57	64.6	438

TABLE 2
APPENDIX III ANALYTICAL RESULTS: 2017 - 2020
PDP 5 DETECTION MONITORING PROGRAM

Sample Location	Date Sampled	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Flouride (mg/L)	field pH standard units	SO_4 (mg/L)	TDS (mg/L)
MW-17A	09/22/17	0.402	3.1	8.3	<0.1	6.78	31.2	111
	06/14/18	0.485	6.48	9.16	<0.1	6.87	45.9	129
	09/11/18	0.523	5.06	8.82	0.179 J	5.03	43.1	137
	05/13/19	0.497	4.88	9.18	<0.1	6.79	44.7	145
	11/07/19	0.52	5.05	8.81	<0.100	6.44	43.9	127
	05/19/20	0.521	5.09	8.74	<0.100	6.57	46.8	140
	09/25/20	0.477	5.76	10.1	<0.100	6.57	47.7	133
MW-18A	09/21/17	0.0654	1.04	5.27	<0.1	6.94	3.23	45
	06/14/18	0.102	2	6.56	<0.1	6.92	3.48	71
	09/12/18	0.211	3.23	9.06	<0.1	5.69	4.82	150
	11/7/2018 re-sample	0.128	--	--	--	--	--	--
	05/13/19	0.117	1.01	6.17	0.138 J	6.64	3.23	73
	11/07/19	0.127	11.5	6.34	<0.100	6.23	3.67	68
	05/19/20	0.225	1.54	7.09	<0.100	6.89	5.97	86
	09/25/20	0.188	1.66	8.13	<0.100	6.78	6.03	77
MW-19	09/22/17	0.0677	2.74	5.36	<0.1	6.94	1.46 J	98
	06/14/18	0.577	133	24.4	0.216 J	6.78	328	758
	09/11/18	0.243	38	65.1	0.228 J	6.04	166	597
	11/07/18	--	--	5.22	--	--	--	--
	05/13/19	0.429	122	26.8	0.229 J	6.72	349	813
	11/08/19	0.529	77.8	49.3	0.189 J	6.87	310	844
	05/19/20	0.0724	1.49	5.84	<0.100	6.91	1.02 J	85
	09/25/20	0.412	94.6	14.3	0.111 J	6.92	160	462
MW-20A	09/22/17	0.0807	17.4	12.6	0.175 J	6.71	74.2	237
	02/21/18 re-sample	--	--	10.7	--	--	--	--
	06/13/18	0.171	24	10.9	0.672	6.72	132	250
	09/11/18	0.141	7.16	11	0.235 J	4.70	39.1	154
	05/13/19	0.239	37.4	10.2	0.731	6.81	178	328
	11/08/19	0.132	9.9	10.2	0.465	6.51	88	205
	05/19/20	0.22	24	10.4	0.413	6.83	133	270
	09/25/20	0.107	8.94	12.6	0.132 J	6.68	54.3	162

TABLE 2
APPENDIX III ANALYTICAL RESULTS: 2017 - 2020
PDP 5 DETECTION MONITORING PROGRAM

PDP-22	09/22/17	0.221	92.5	12.3	0.321 J	6.98	178	558
	06/14/18	0.115	7.78	11.8	0.239	6.63	186	491
	09/12/18	0.164	61.1	10.9	0.216 J	5.88	143	476
	05/13/19	0.158	98.2	10.1	0.303 J	6.86	184	615
	11/12/19	0.226	34.3	12.6	0.218 J	6.93	215	482
	05/19/20	0.0646	54.9	1.06	<0.100	6.55	5.21	205
	09/25/20	0.206	25.1	12.7	0.128 J	6.73	186	398
PDP-23	09/22/17	0.0463	2.34	4.48	0.147 J	6.77	1.47 J	111
	02/21/18 re-sample	--	2.37	--	--	--	--	--
	06/13/18	0.0357	2.29	6.21	<0.1	6.82	1.26 J	98
	09/11/18	0.0760	1.96	6.38	<0.1	5.32	1.52 J	98
	11/7/2018 re-sample	0.0683	--	--	--	--	--	--
	05/13/19	0.0628	1.89	6.98	<0.1	6.68	1.28 J	103
	11/12/19	0.0675	2.14	4.98	<0.100	6.72	1.41 J	93
	05/19/20	0.0709	2.03	6.86	<0.100	6.83	1.19 J	104
	09/25/20	0.0617	2.31	7.29	<0.100	6.74	<1.00	94
PDP-24	09/22/17	3.01	25.8	17.5	0.898	6.95	231	440
	06/14/18	2.71	23.9	21.1	0.629	6.82	284	481
	09/11/18	4.08	41.6	19.4	0.832	4.20	460	760
	05/13/19	3.23	23	21	0.871	6.95	300	537
	11/12/19	3	21.9	20.6	0.751	6.87	295	520
	11/12/19	2.97	22.2	20.5	0.744	6.87	300	504
	05/19/20	3.17	21.4	21	0.61	6.79	286	512
	09/25/20	4.04	40.7	19.6	0.776	6.83	445	699
PDP-25	09/22/17	0.133	36.8	130	0.157 J	6.81	89.1	481
	06/14/18	0.119	40.4	111	<0.1	6.78	73.4	439
	09/11/18	0.167	36.2	135	0.115 J	5.87	90.3	469
	11/7/2018 re-sample	0.142	--	--	--	--	--	--
	05/13/19	0.144	44.4	108	0.121 J	6.84	69	469
	11/12/19	0.184	38.6	117	<0.100	6.82	71.4	454
	05/19/20	0.202	53.7	105	<0.100	6.61	62.2	442
	09/25/20	0.174	46.3	123	<0.100	6.77	67.5	445
PDP-26	09/22/17	0.0343	2.32	5.24	0.157 J	6.84	5.88	107
	06/14/18	0.0225 J	2.93	4.8	<0.1	6.89	4.27	100
	09/12/18	0.0371	2.37	4.88	<0.1	6.07	2.66 J	107
	05/13/19	0.0528	1.9	4.59	0.217 J	6.86	2.7 J	106
	11/12/19	0.0622	2.25	4.64	0.122 J	6.77	2.1 J	102
	05/19/20	0.0538	2.09	4.52	<0.100	6.64	2.1 J	108
	09/25/20	0.0549	2.71	5.07	<0.100	6.83	1.91	92

Notes:
1. J - concentration is below sample quantitation limit; result is an estimate.

TABLE 3
APPENDIX III AND GENERAL CHEMISTRY ANALYTICAL RESULTS
PDP 5 WATER SAMPLE

Sample Location	Date Sampled	B (mg/L)	Ca (mg/L)	Cl (mg/L)	F (mg/L)	pH (SU)	SO4 (mg/L)	TDS (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Alkalinity, as CaCO3			
												HCO3 (mg/L)	CO3 (mg/L)	OH (mg/L)	Total (mg/L)
PDP-5	10/28/21	41.7	605	607	18.8	8.31	2,660	9,440	1,020	75.1	584	123	<10.0	<10.0	123

Notes:

1. J - concentration is below sample quantitation limit; result is an estimate.
2. All values reported as dissolved concentrations.

TABLE 4

APPENDIX IV ANALYTICAL DATA
PDP-5 WATER SAMPLE

Sample Location	Date Sampled	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Cd (mg/L)	Cr (mg/L)	Co (mg/L)	F (mg/L)	Pb (mg/L)	Li (mg/L)	Hg (mg/L)	Mo (mg/L)	Se (mg/L)	Tl (mg/L)	Ra 226 (pCi/L)	Ra 228 (pCi/L)	Ra 226/228 Comb.^ (pCi/L)
GWPS:	--	0.006	0.01	2.0	0.004	0.005	0.1	0.006	4.0	0.015	0.04	0.002	0.1	0.05	0.002	--	--	5
PDP-5	10/28/21	0.00332	0.00352 J	0.0878	<0.0003	<0.0003	<0.002	<0.003	18.8	<0.0003	0.219	<0.00008	0.0963	1.22	0.000793 J	PEND	PEND	PEND

Notes:
1. Abbreviations: mg/L - milligrams per liter; pCi/L - picocuries per liter, PEND - results pending.
2. ^ - Sum of Ra 226 and Ra 228 concentrations. Non-detect isotope results were assigned a value equal to the minimum detectable concentration.
3. J - concentration is below method quantitation limit; result is an estimate.
4. All PDP-5 values reported as dissolved concentrations.

TABLE 5
APPENDIX III AND GENERAL CHEMISTRY DATA
PDP-5 WATER SAMPLE COMPARED TO EPA 90TH PERCENTILE POREWATER AND WASTEWATER CONCENTRATIONS

Sample Location	Date Sampled	B (mg/L)	Ca (mg/L)	Cl (mg/L)	F (mg/L)	pH (SU)	SO4 (mg/L)	TDS (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Alkalinity, as CaCO3			
												HCO3 (mg/L)	CO3 (mg/L)	OH (mg/L)	Total (mg/L)
PDP-5	10/28/21	41.7	605	607	18.8	8.31	2,660	9,440	1,020	75.1	584	123	<10.0	<10.0	123
90th Percentile Pore Water	--	97.8	592	2023	21.3	NA	4,398	NA	174	221.0	3,288	NA	NA	NA	NA
90th Percentile Wastewater	--	36.2	577	345	NA	NA	10,400	NA	1,990	40.0	743	NA	NA	NA	NA

Notes:

1. J - concentration is below sample quantitation limit; result is an estimate.
2. PDP-5 values reported as dissolved concentrations.
3. NA = Not applicable, no concentration provided.

TABLE 6

APPENDIX IV DATA
PDP-5 WATER SAMPLE COMPARED TO EPA 90TH PERCENTILE POREWATER AND WASTEWATER CONCENTRATIONS

Sample Location	Date Sampled	Sb (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Cd (mg/L)	Cr (mg/L)	Co (mg/L)	F (mg/L)	Pb (mg/L)	Li (mg/L)	Hg (mg/L)	Mo (mg/L)	Se (mg/L)	Tl (mg/L)	Ra 226 (pCi/L)	Ra 228 (pCi/L)	Ra 226/228 Comb.^ (pCi/L)
PDP-5	10/28/21	0.00332	0.00352 J	0.0878	<0.0003	<0.0003	<0.002	<0.003	18.8	<0.0003	0.219	<0.00008	0.0963	1.22	0.000793 J	PEND	PEND	PEND
90th Percentile Pore Water	--	0.04	0.78	0.21	0.001	0.06	0.20	0.05	21.3	0.01	0.45	0.000007	7.1	0.32	0.003	NA	NA	NA
90th Percentile Wastewater	--	0.02	0.13	0.43	0.001	0.003	0.03	0.02	NA	0.0006	1.99	0.000030	0.42	0.10	0.009	NA	NA	NA

Notes:
1. Abbreviations: mg/L - milligrams per liter; pCi/L - picocuries per liter, PEND - results pending.
2. ^ - Sum of Ra 226 and Ra 228 concentrations. Non-detect isotope results were assigned a value equal to the minimum detectable concentration.
3. J - concentration is below method quantitation limit; result is an estimate.
4. PDP-5 values reported as dissolved concentrations.
5. NA = Not applicable, no concentration provided.

TABLE 8
GEOCHEMICAL MODELING
1-D TRANSPORT RESULTS
PDP-5 COMPACTED CLAY LINER

	Arsenic	Antimony	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Radium 226+228	Selenium	Thallium
GWPS	0.01	0.006	2	0.004	0.005	0.1	0.006	0.015	0.04	0.002	0.1	5	0.05	0.002
PDP-5 Water	2.20E-09	0.0033	0.30	1.07E-09	2.00E-06	2.85E-12	9.30E-04	4.71E-10	0.229	8.00E-05	1.01E-08	4.91	8.63E-07	7.89E-04
90th Percentile EPA Porewater	3.48E-09	0.04	0.38	1.27E-09	7.16E-04	3.79E-12	5.10E-05	8.42E-10	0.45	4.00E-05	1.32E-08	4.74	9.93E-07	0.003

Note:

1. Shaded cells indicate an exceedance of the GWPS

TABLE 9
ESTIMATED MASS FLUX OF PDP-5 LINER BREAKTHROUGH CONSTITUENTS
RELATIVE TO MASS IN CLOSED PDP-1, -2 AND -3
PDP-5 WATER SAMPLE

Assumptions:

1) PDP-5 Surface Area: 40 acres

2) Seepage Rate Through PDP-5 Liner: 6.50E-07 cm/sec
0.0018 ft/day

3) Closed PDP-1, -2 and -3 Ash Volume: 1,920,000 CY

4) Ash Dry Unit Weight in PDP-1, -2 and -3: 80 lb/cf

5) PDP-5 Liner Breakthrough Constituents and Concentrations (From Geochemical Modelling):

- Lithium: 0.229 mg/L

6) Concentration of Constituents in PDP-1, -2 and -3 Ash:

- Lithium: 24.6 mg/Kg

PDP-5 Liner Breakthrough Constituent	Mass Flux of Constituent Through PDP-5 Liner (lb/day)	(lb/year)	Existing Mass of Constituent in PDP-1, -2 and -3 (lb)	Annual Mass Flux Through PDP-5 Liner as Percentage of Existing Mass (%)
Lithium	0.046	16.7	102,021	0.016

TABLE 10
ESTIMATED MASS FLUX OF PDP-5 LINER BREAKTHROUGH CONSTITUENTS
RELATIVE TO MASS IN CLOSED PDP-1, -2 AND -3
EPA 90TH PERCENTILE PORE WATER CONCENTRATIONS

Assumptions:

1) PDP-5 Surface Area: 40 acres

2) Seepage Rate Through PDP-5 Liner: 6.50E-07 cm/sec
0.0018 ft/day

3) Closed PDP-1, -2 and -3 Ash Volume: 1,920,000 CY

4) Ash Dry Unit Weight in PDP-1, -2 and -3: 80 lb/cf

5) PDP-5 Liner Breakthrough Constituents and Concentrations (From Geochemical Modelling):

- Lithium: 0.45 mg/L
- Antimony: 0.04 mg/L
- Thallium: 0.0034 mg/L

6) Concentration of Constituents in PDP-1, -2 and -3 Ash:

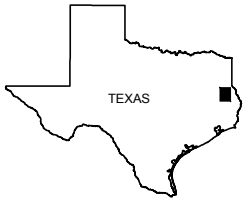
- Lithium: 24.6 mg/Kg
- Antimony: 47 mg/Kg
- Thallium: 33.9 mg/Kg

PDP-5 Liner Breakthrough Constituent	Mass Flux of Constituent Through PDP-5 Liner (lb/day)	(lb/year)	Existing Mass of Constituent in PDP-1, -2 and -3 (lb)	Annual Mass Flux Through PDP-5 Liner as Percentage of Existing Mass (%)
Lithium	0.090	32.9	102,021	0.032
Antimony	0.008	2.9	194,918	0.0015
Thallium	0.001	0.25	140,590	0.0002

FIGURES

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.



PHOTOGRAPH LOCATION

CLIENT

LUMINANT GENERATION COMPANY LLC

PROJECT

MARTIN LAKE STEAM ELECTRIC STATION
PDP-5
ALTERNATE LINER DEMONSTRATION

TITLE

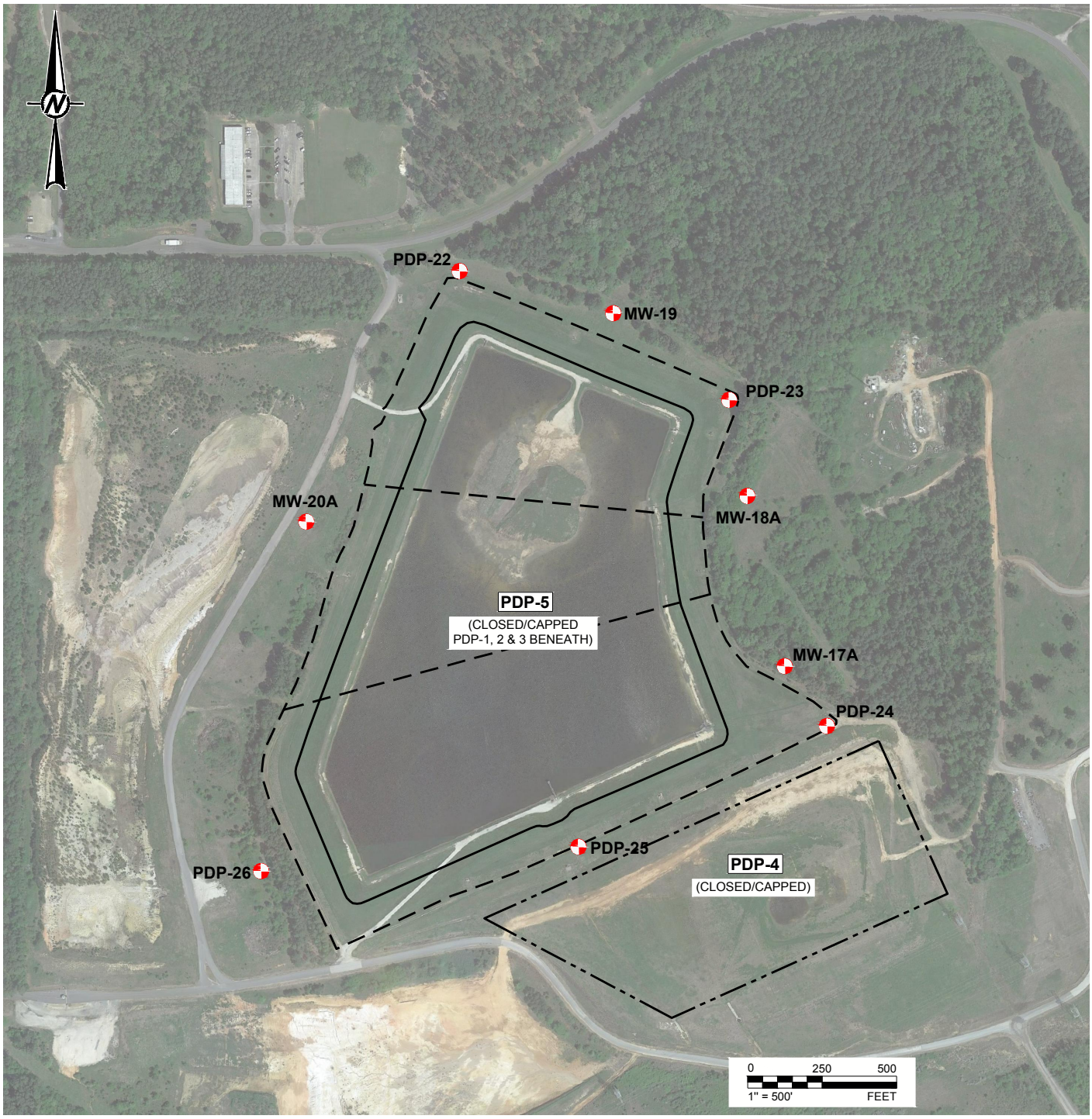
SITE LOCATION MAP

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	PJB
APPROVED	PJB

PROJECT NO.	CONTROL	REV.	FIGURE
20142271		0	1



LEGEND

- CCR MONITORING WELL
- APPROXIMATE EXTENT OF CLOSED PDP 1, 2 & 3
- EXTERIOR TOE OF PDP-5 BERMS
- APPROXIMATE EXTENT OF CLOSED PDP-4

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.

CLIENT
LUMINANT GENERATION COMPANY LLC

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
PDP-5
ALTERNATE LINER DEMONSTRATION

TITLE
SITE PLAN

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	PJB
APPROVED	PJB

PROJECT NO.	CONTROL	REV.	FIGURE
20142271		0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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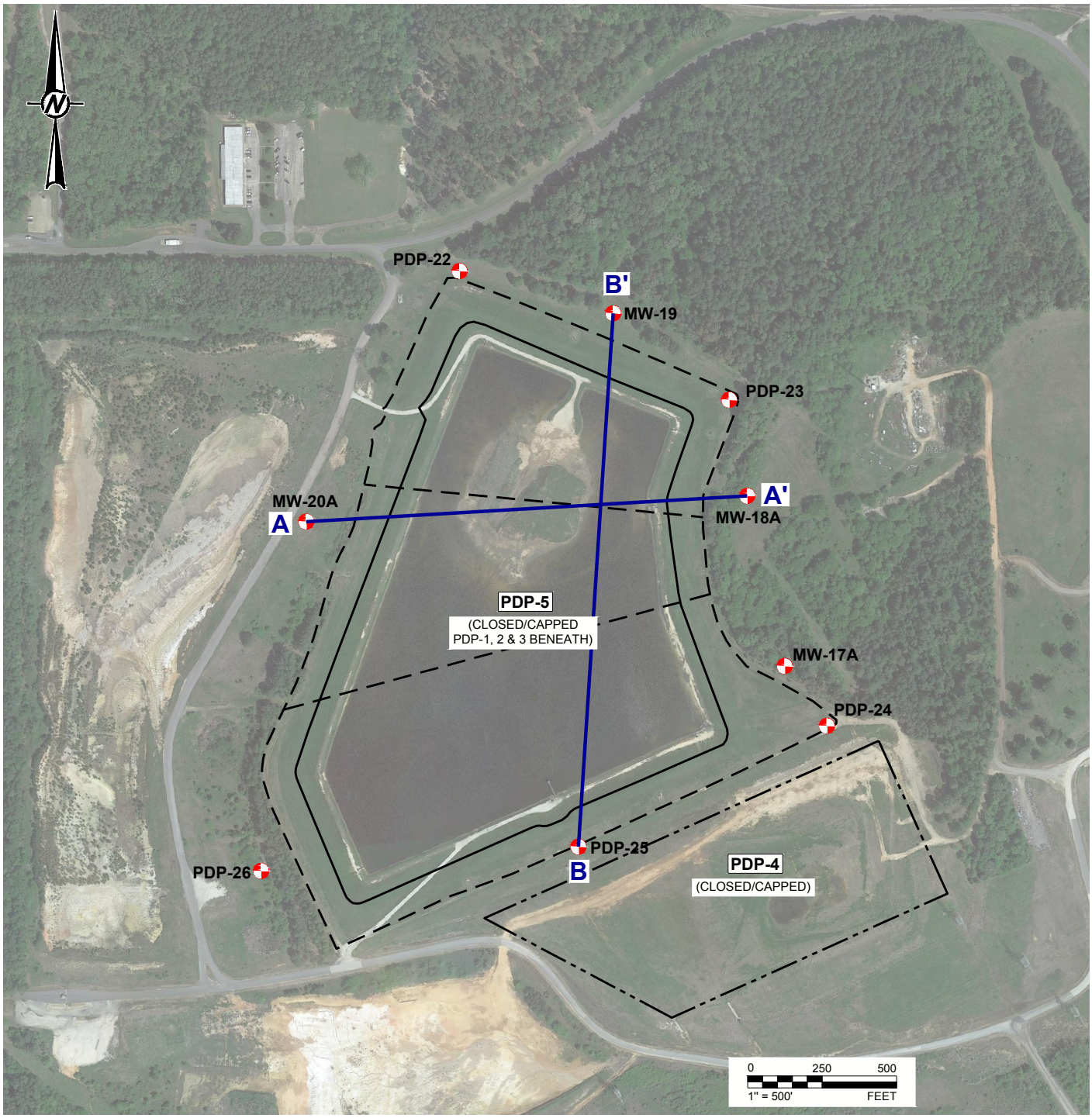

LEGEND

- CCR MONITORING WELL
- APPROXIMATE EXTENT OF CLOSED PDP 1, 2 & 3
- EXTERIOR TOE OF PDP-5 BERMS
- APPROXIMATE EXTENT OF CLOSED PDP-4
- A — A' GEOLOGIC CROSS SECTION LOCATION LINES

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.

CLIENT
LUMINANT GENERATION COMPANY LLC

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
PDP-5
ALTERNATE LINER DEMONSTRATION

TITLE
CROSS SECTION LOCATION PLAN

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	PJB
APPROVED	PJB

PROJECT NO.	CONTROL	REV.	FIGURE
20142271		0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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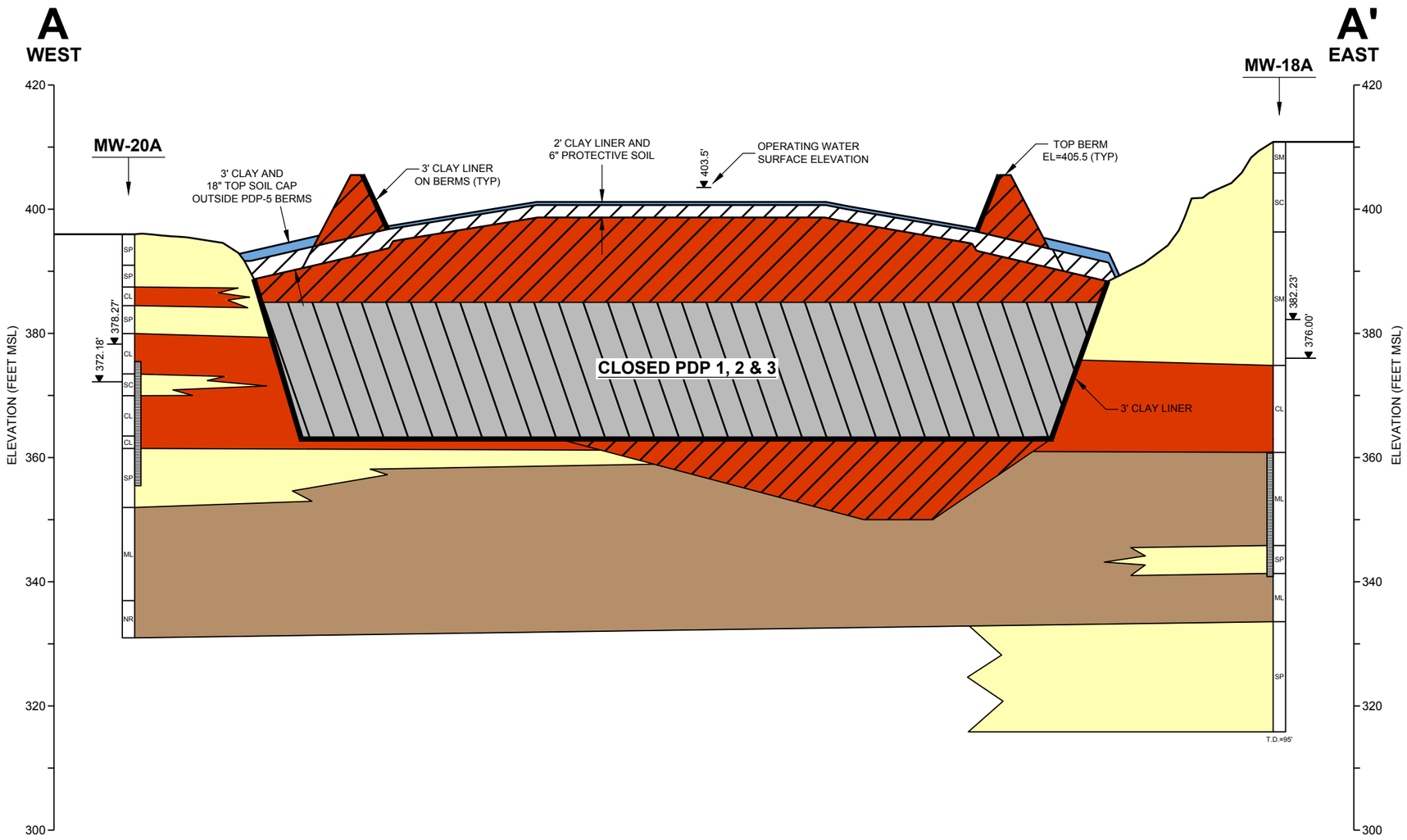
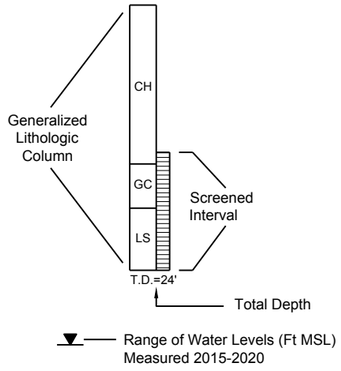


LEGEND

- SAND
- CLAY
- SILT
- TOP SOIL
- CLOSED PDP 1, 2 & 3
- PDP-5 CLAY LINER AND CLOSED PDP 1, 2 & 4 CLAY CAP
- FILL

MONITORING WELL CONSTRUCTION



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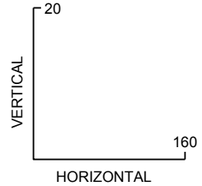


8x Vertical Exaggeration

CLIENT
LUMINANT GENERATION COMPANY LLC

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
PDP-5
ALTERNATE LINER DEMONSTRATION

TITLE
GEOLOGIC CROSS SECTION - A-A'

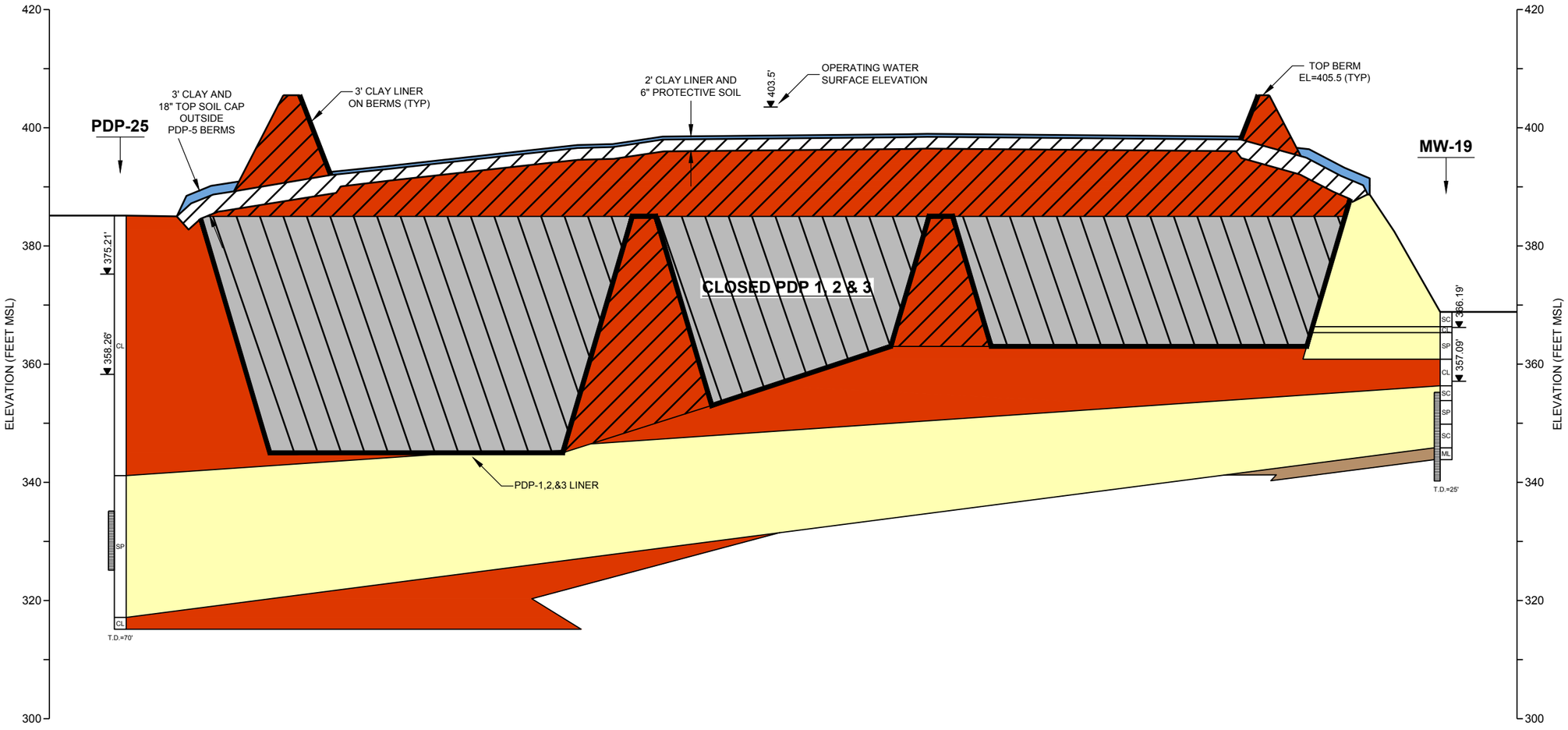
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	PJB
APPROVED	PJB

PROJECT NO. 20142271 | CONTROL | REV. 0 | FIGURE 4

B
SOUTH

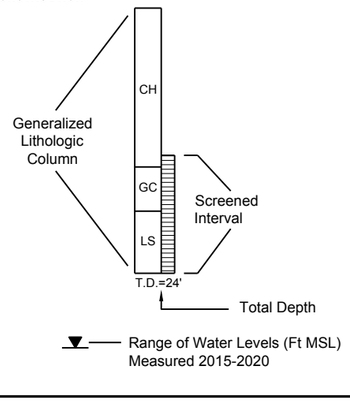
B'
NORTH



LEGEND

- SAND
- CLAY
- SILT
- TOP SOIL
- CLOSED PDP 1, 2 & 3
- PDP-5 CLAY LINER AND CLOSED PDP 1, 2 & 4 CLAY CAP
- FILL

MONITORING WELL CONSTRUCTION



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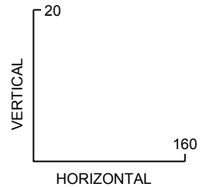


8x Vertical Exaggeration

CLIENT
LUMINANT GENERATION COMPANY LLC

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
PDP-5
ALTERNATE LINER DEMONSTRATION

TITLE
GEOLOGIC CROSS SECTION - B-B'

CONSULTANT
GOLDER
MEMBER OF WSP

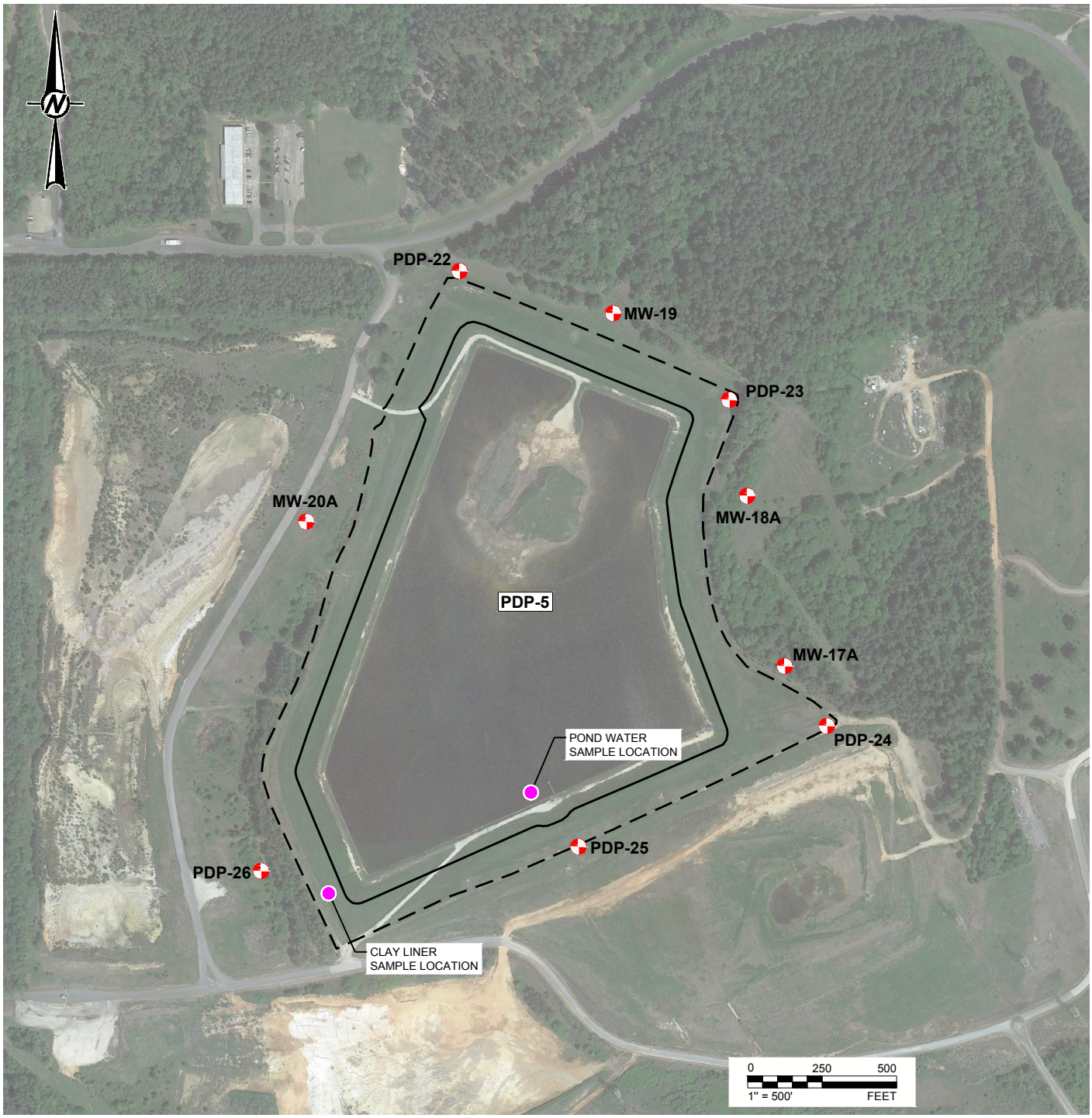
YYYY-MM-DD	2021-11-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	PJB
APPROVED	PJB

PROJECT NO. 20142271 | CONTROL | REV. 0 | FIGURE 5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

0



LEGEND

- CCR MONITORING WELL
- APPROXIMATE EXTENT OF CLOSED PDP 1, 2 & 3
- EXTERIOR TOE OF PDP-5 BERMS
- APPROXIMATE SAMPLE LOCATION

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.

CLIENT
LUMINANT GENERATION COMPANY LLC

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
PDP-5
ALTERNATE LINER DEMONSTRATION

TITLE
CLAY LINER AND POND WATER SAMPLE LOCATIONS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-09
DESIGNED	AJD
PREPARED	AJD
REVIEWED	PJB
APPROVED	PJB

PROJECT NO.	CONTROL	REV.	FIGURE
20142271		0	6

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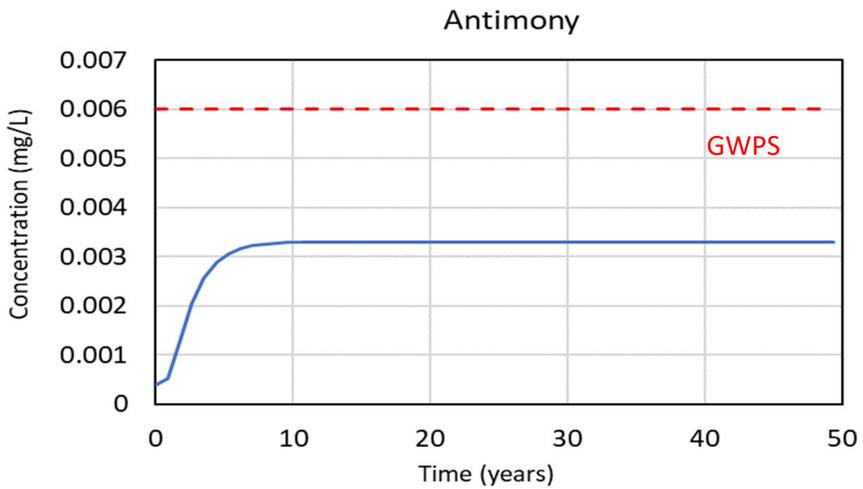

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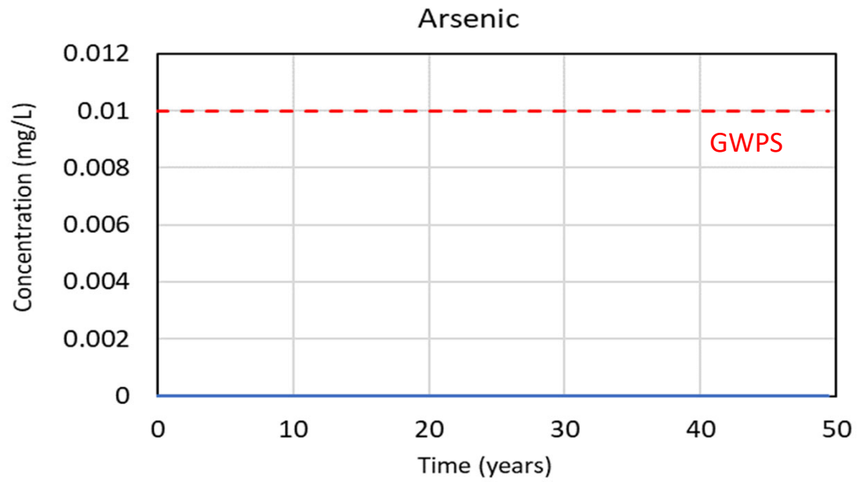

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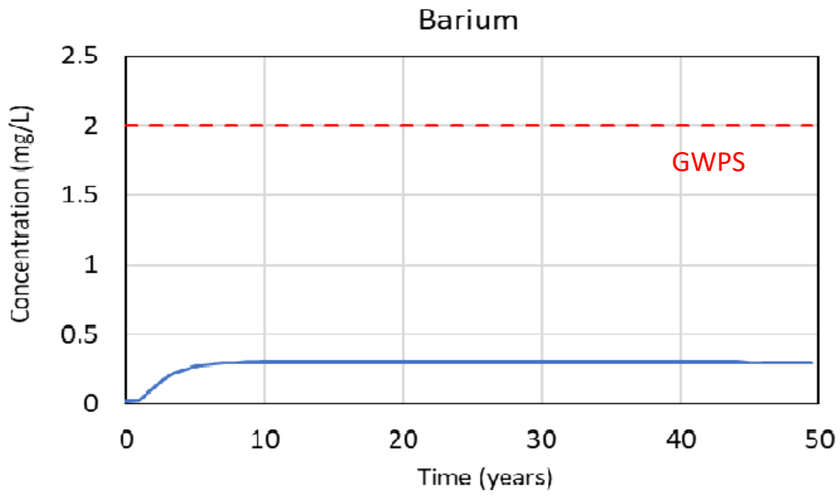

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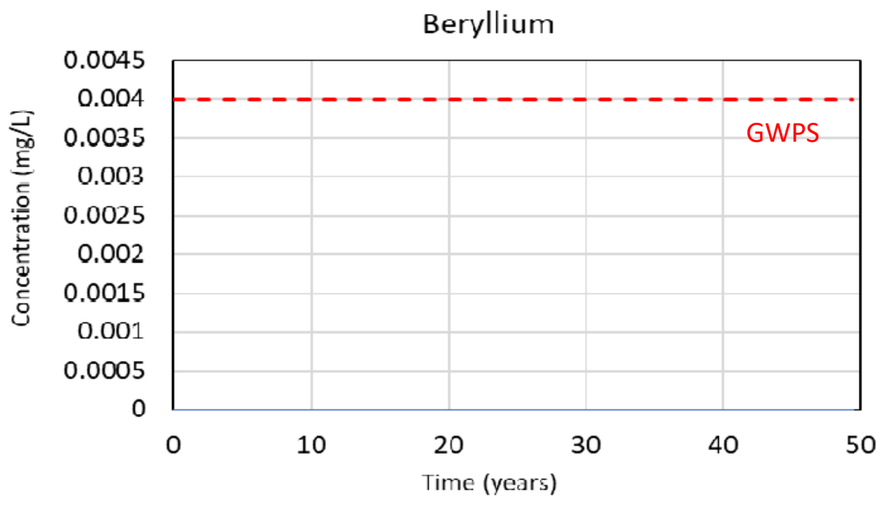


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

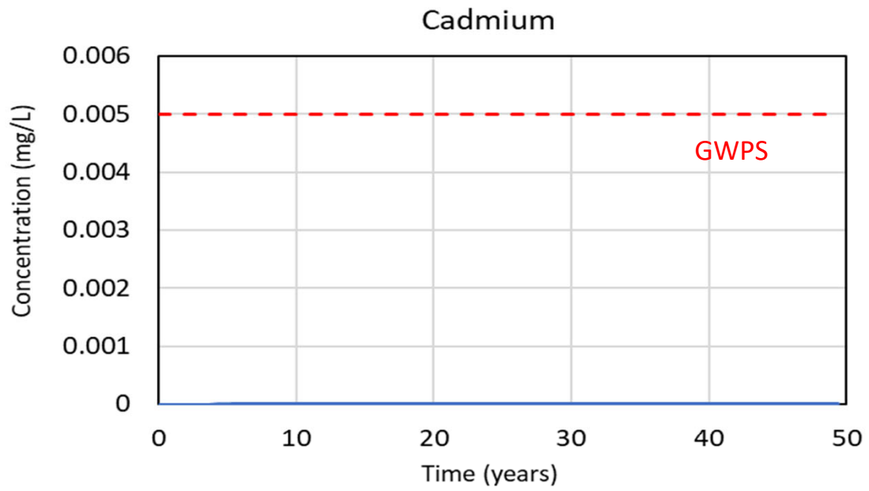
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Antimony, Arsenic, Barium, and Beryllium (a-d)
1-D Transport Model Results for PDP-5

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	7

a)



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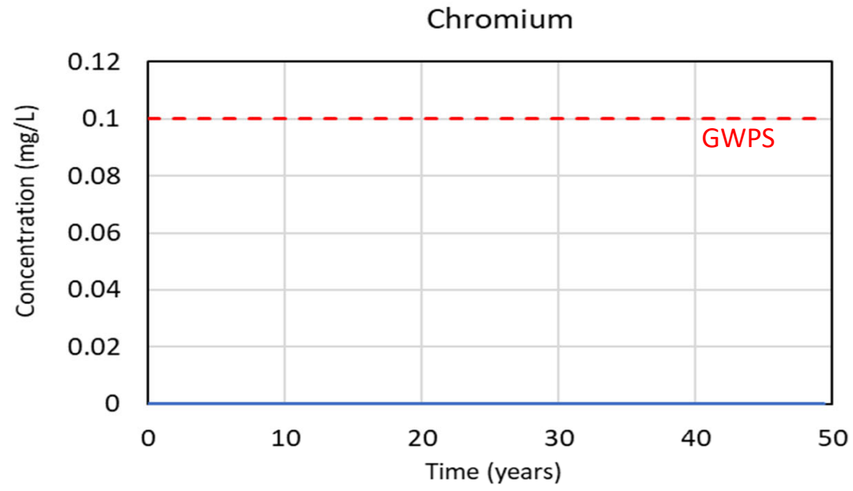

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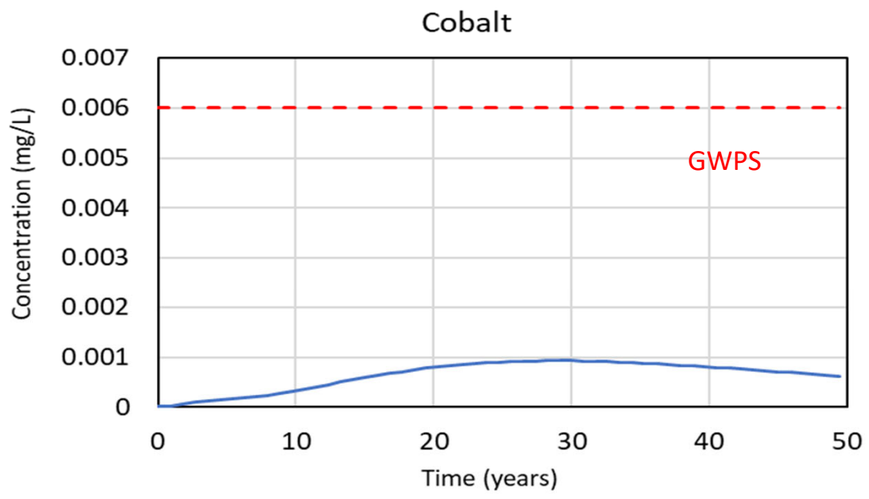

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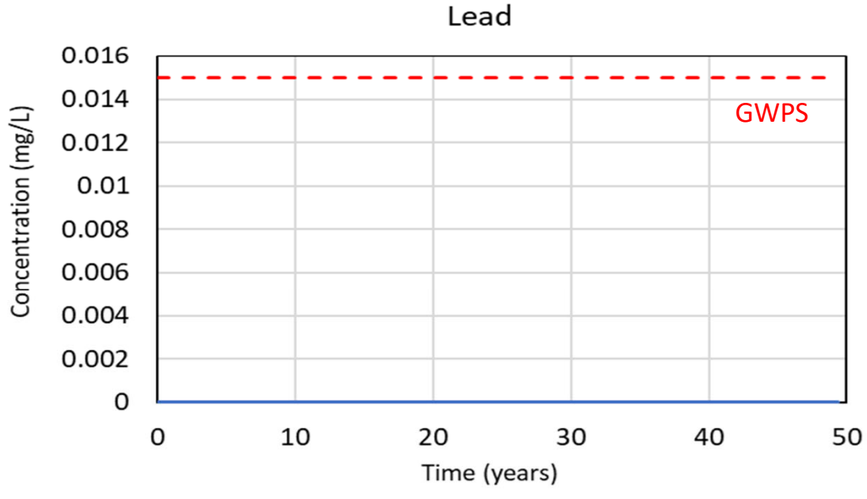


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

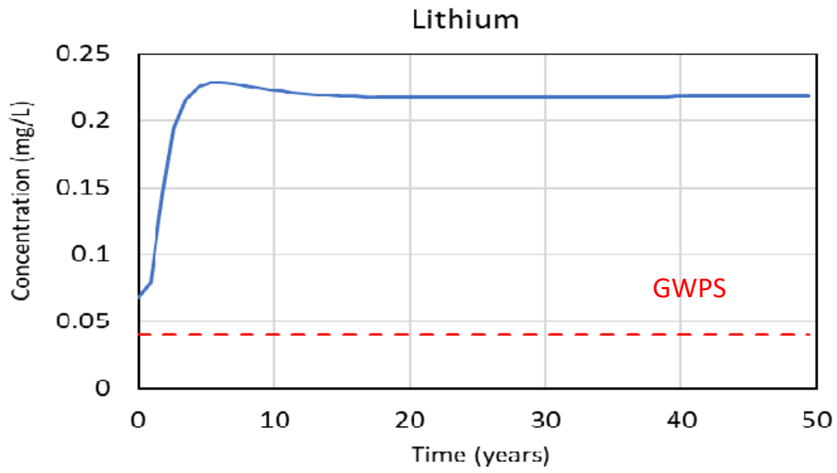
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Cadmium, Chromium, Cobalt, and Lead (a-d)
1-D Transport Model Results for PDP-5

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	8

a)



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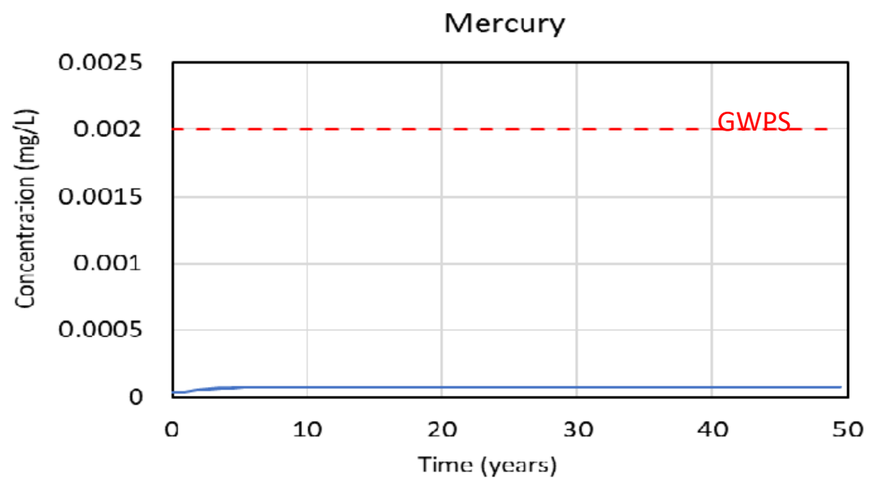

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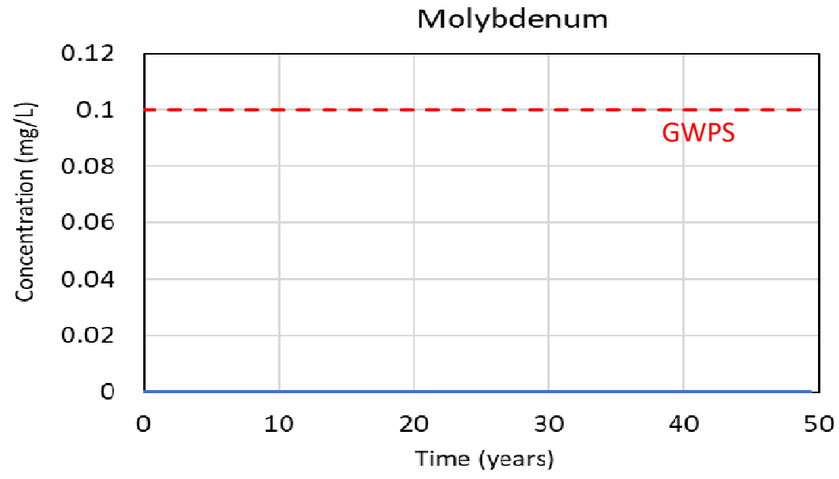

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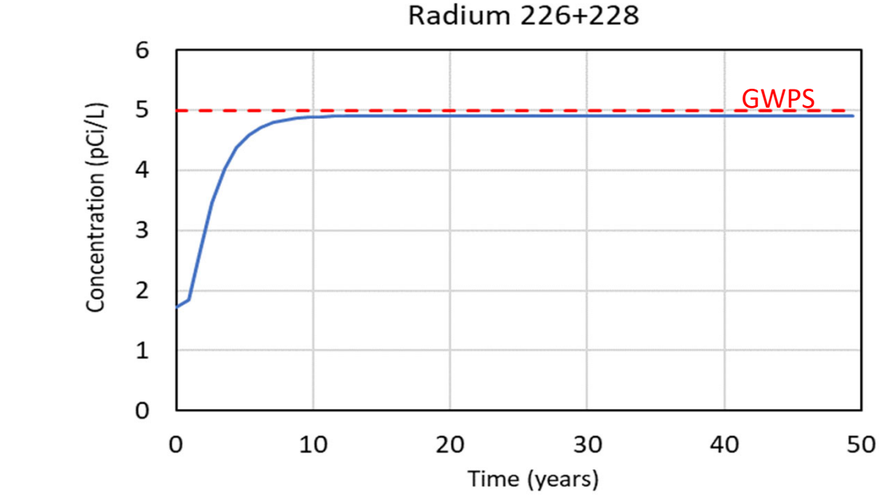


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

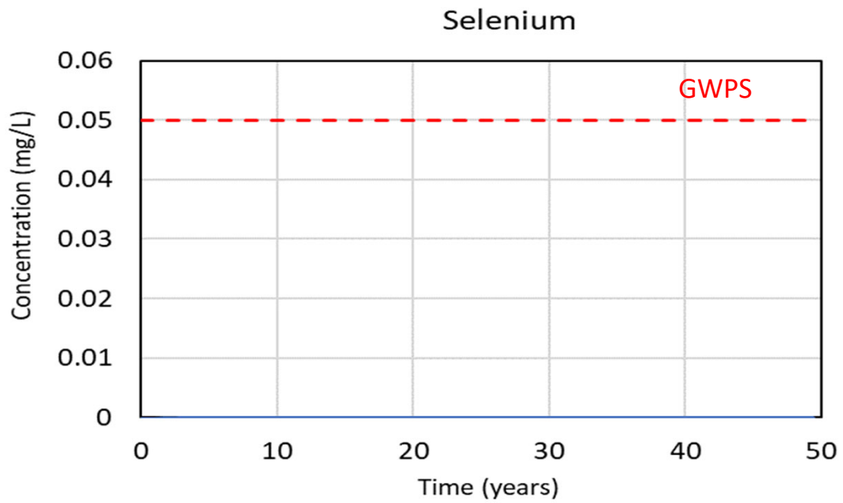
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Lithium, Mercury, Molybdenum, and Radium 226+228 (a-d)
1-D Transport Model Results for PDP-5

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	9

a)



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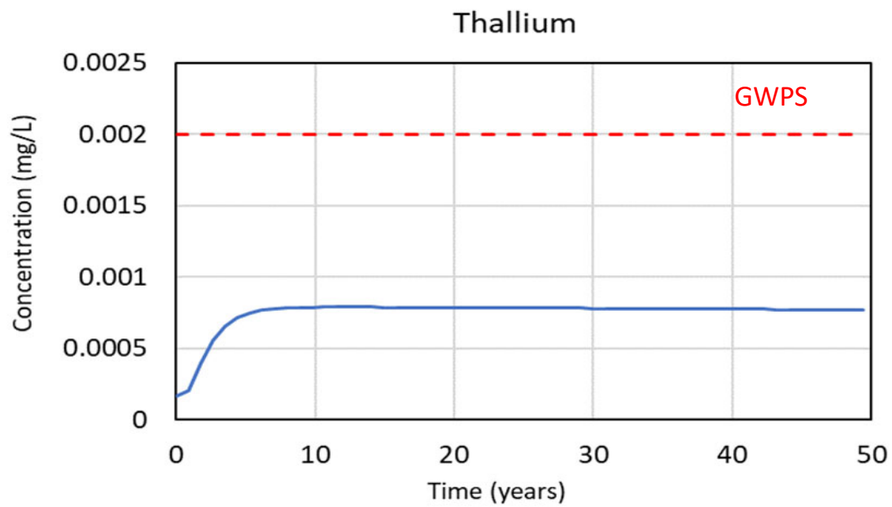


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

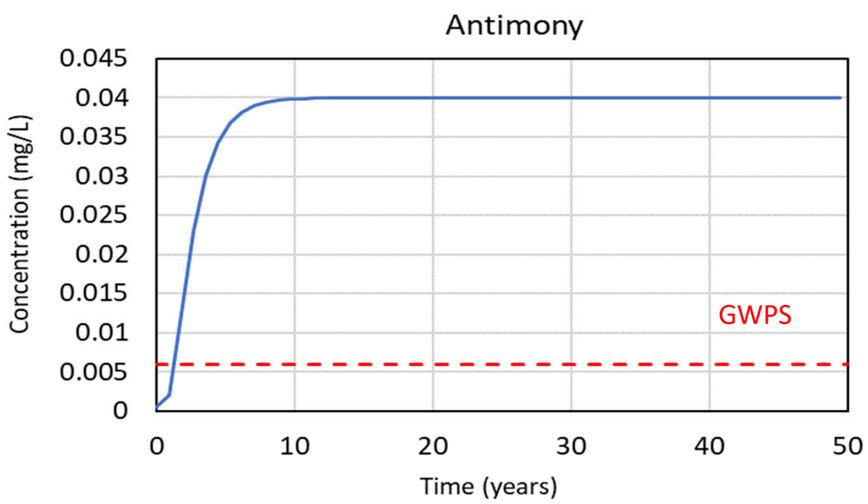
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Selenium & Thallium (a-b)
1-D Transport Model Results for PDP-5

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	10

a)



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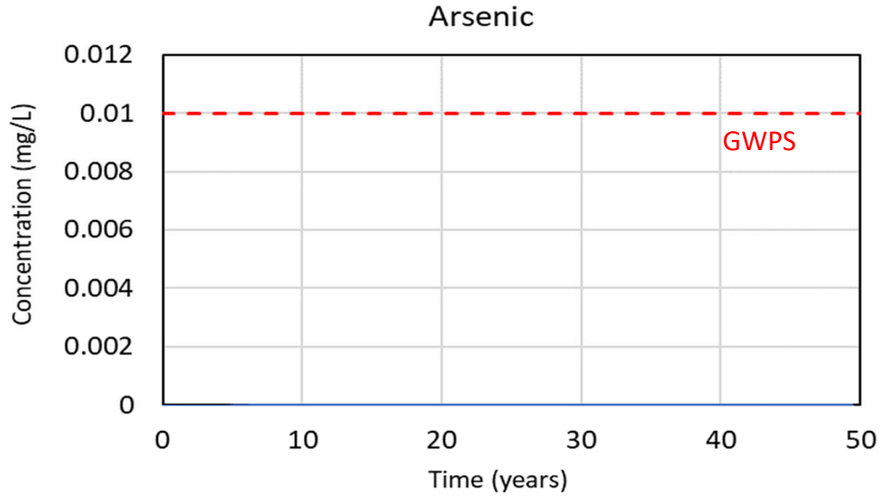

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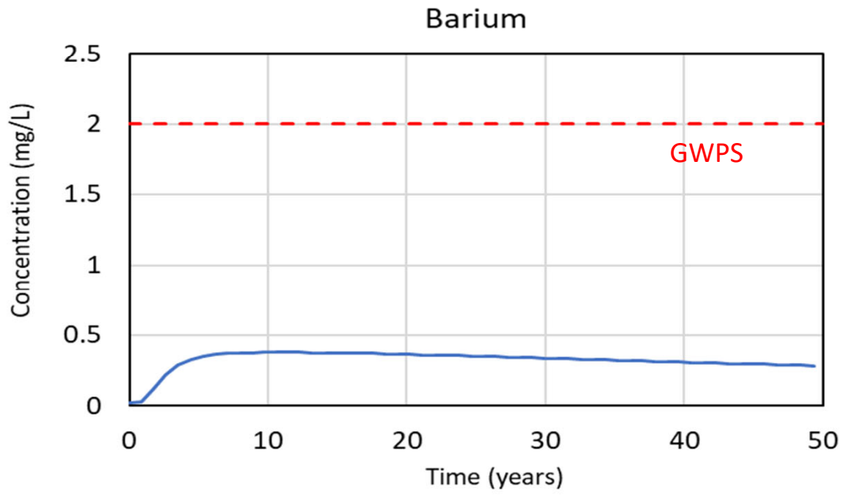

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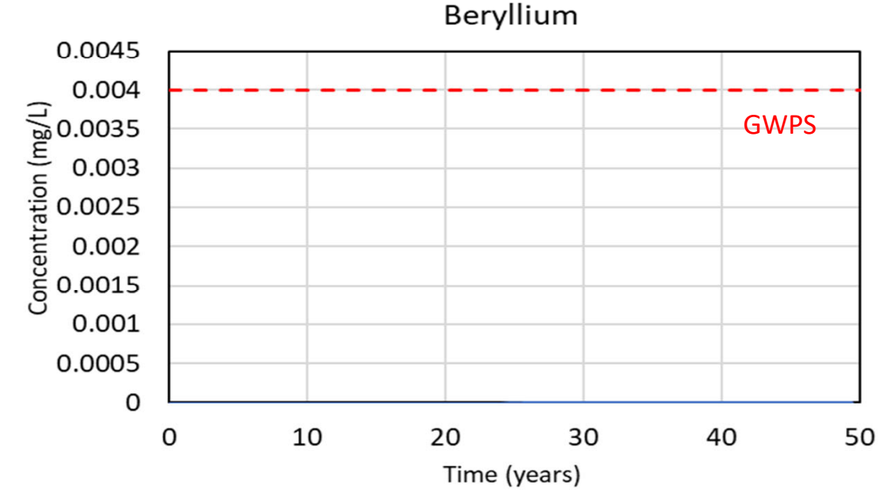


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

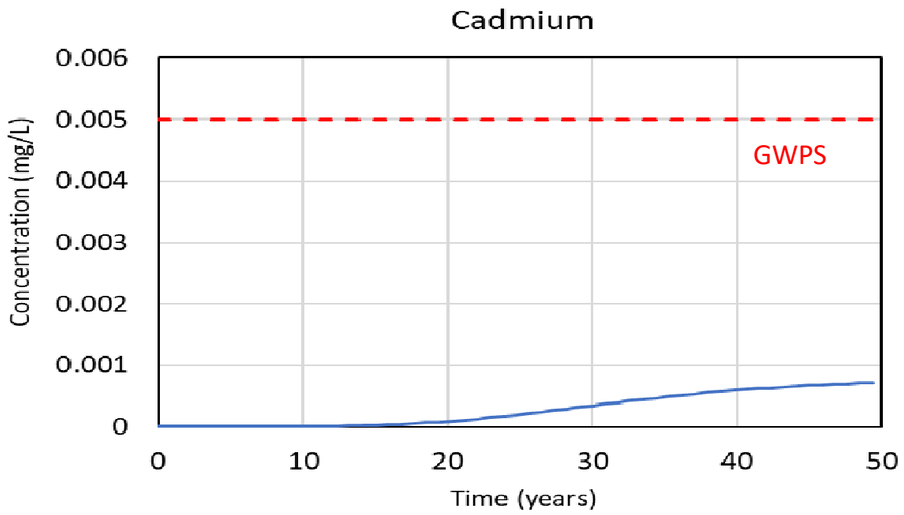
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Antimony, Arsenic, Barium, and Beryllium (a-d)
1-D Transport Model Results for EPA Porewater

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	11

a)



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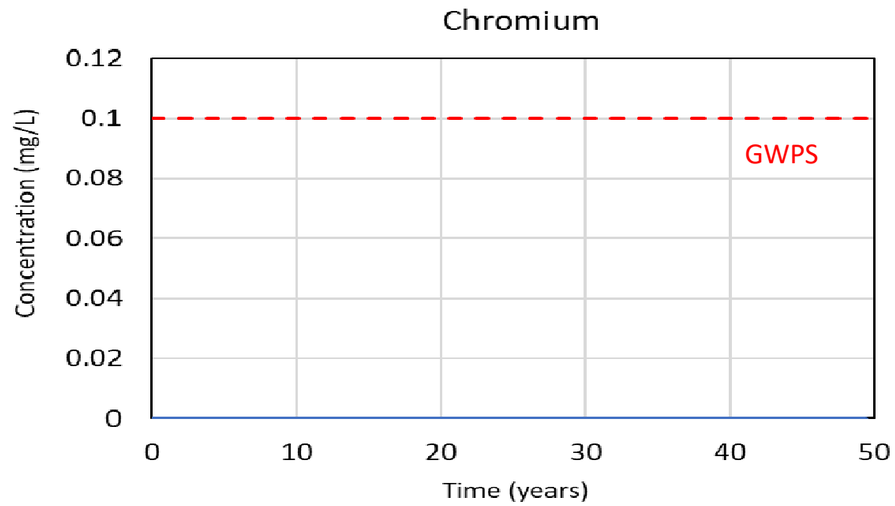

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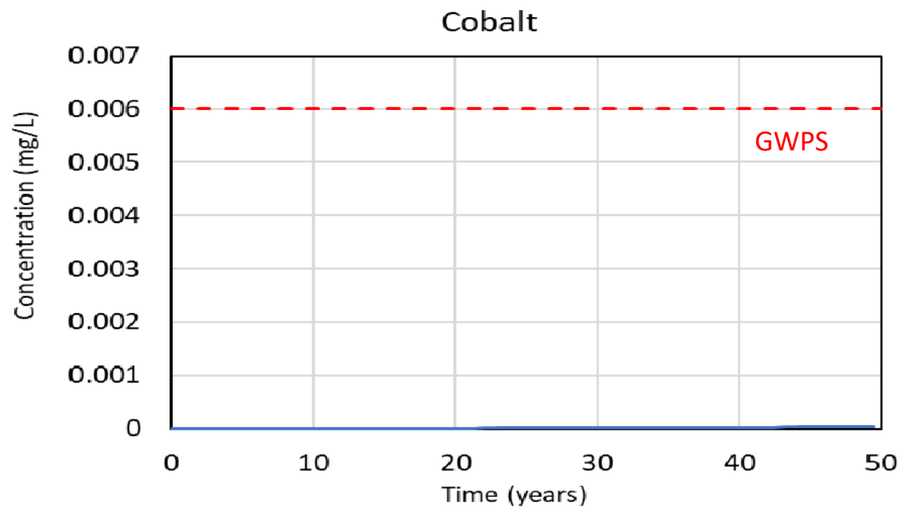

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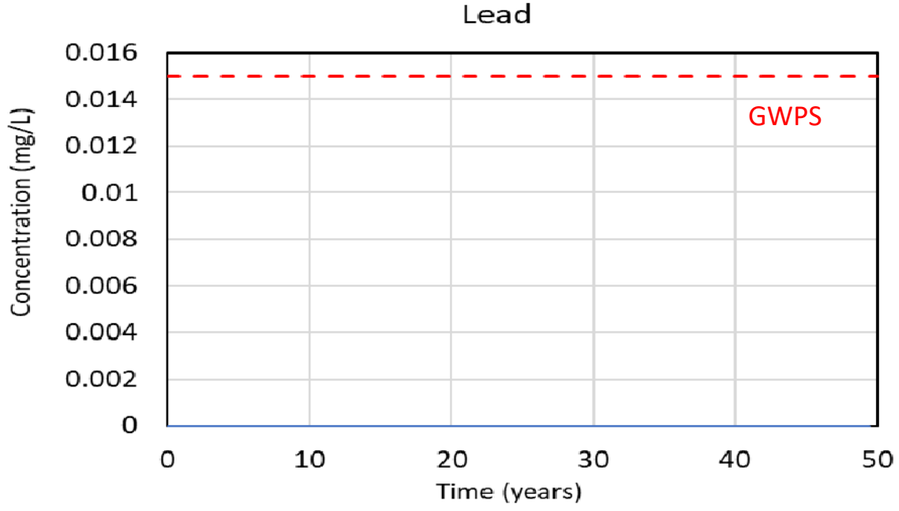


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

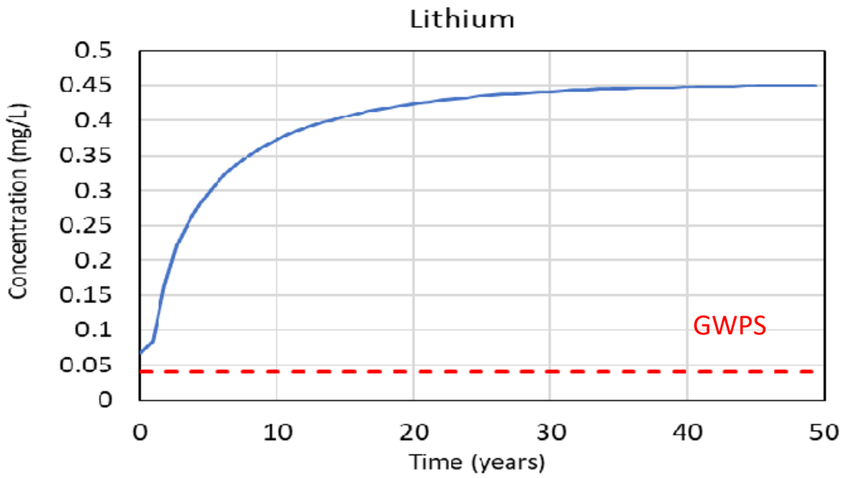
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Cadmium, Chromium, Cobalt, and Lead (a-d)
1-D Transport Model Results for EPA Porewater

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	12

a)



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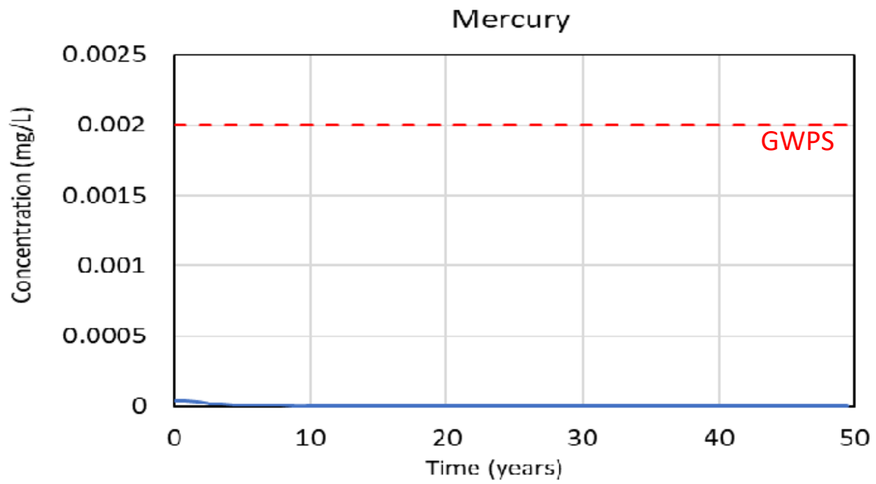

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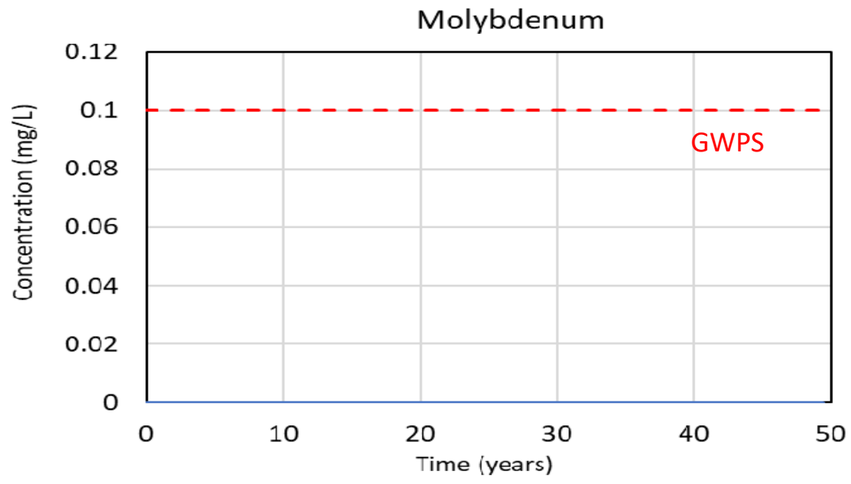

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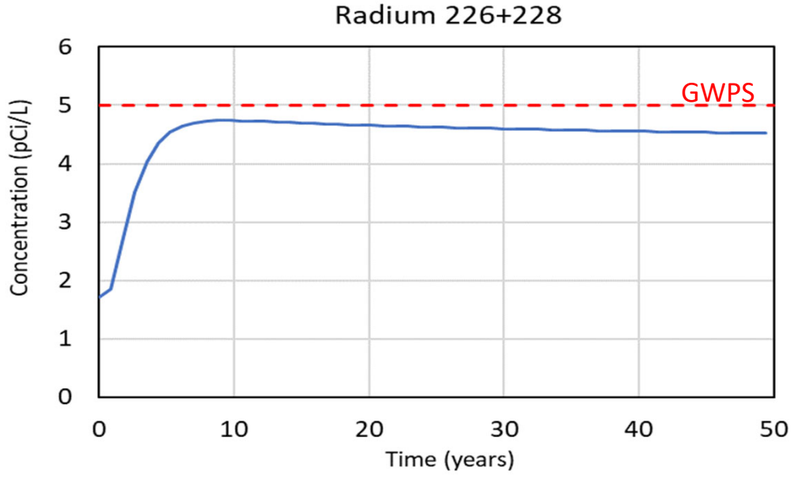


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

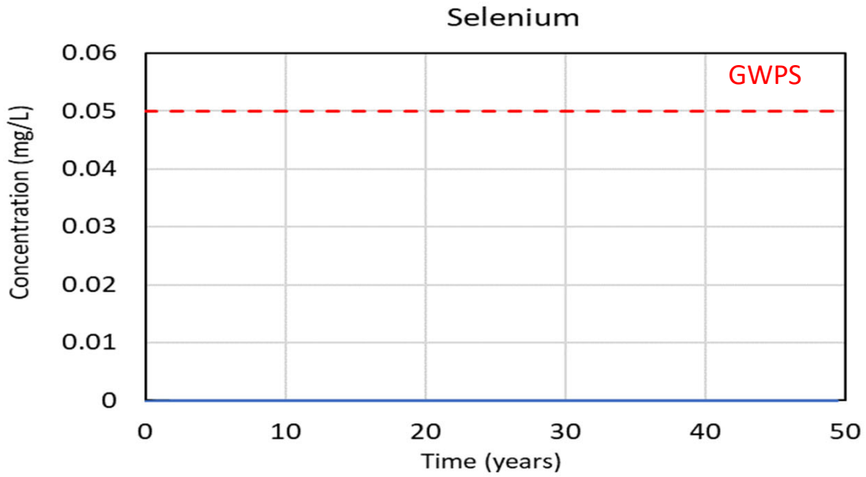
CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Lithium, Mercury, Molybdenum, and Radium 226+228 (a-d)
1-D Transport Model Results for EPA Porewater

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	13

a)



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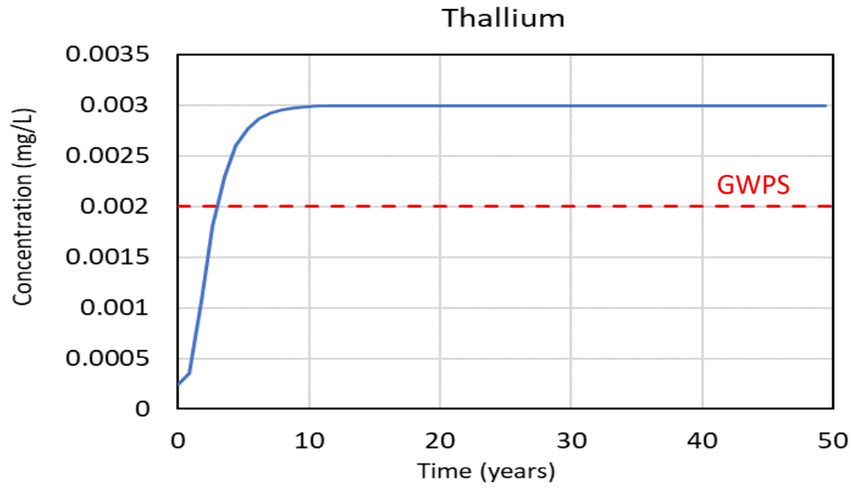


CLIENT
LUMINANT GENERATION COMPANY LLC
MARTIN LAKE STEAM ELECTRIC STATION

CONSULTANT
GOLDER
MEMBER OF WSP

PROJECT
ALTERNATE LINER DEMONSTRATION
MLSES - PDP-5

TITLE
Selenium & Thallium (a-b)
1-D Transport Model Results for EPA Porewater

PROJECT NO.	PHASE	REV.	FIGURE
20142271	1000	A	14

APPENDIX A

CCR Monitoring Well Logs

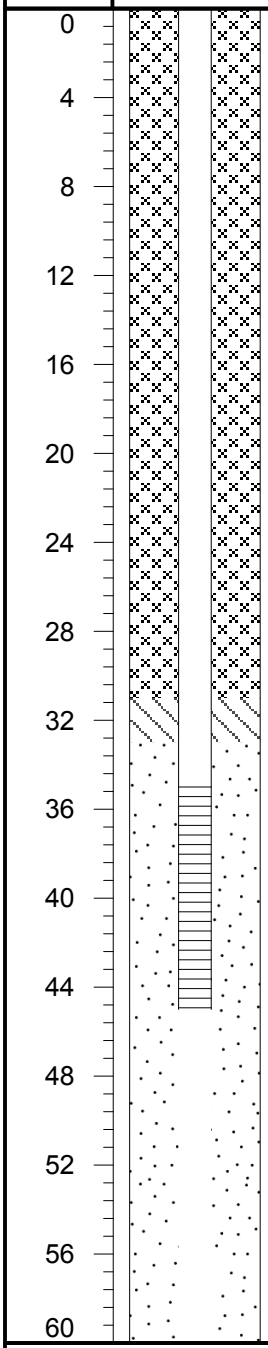
Luminant

Log of Boring: PDP-22

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/9/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	60
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Depth (ft)	Recovery (ft/ft)	USCS	Lithologic Description
0 - 4	8.0/10.0	SP	(0 - 3) Fine SAND, tan, dry, very soft, small iron concretions, grass roots
		CL	(3 - 10) Sandy CLAY, red/orange mottled, dry, firm, moderate cementation, flat to subrounded, sharp contact
8 - 20	10.0/10.0	CH	(10 - 20) Silty CLAY with minor sand, dry, firm, moderate cementation, flat to subrounded, medium to high plasticity, micro laminated structure, increasing sand content with depth, transition from red/gray at 10' to tan at 20'
20 - 28	10.0/10.0	SM	(20 - 28) Sandy SILT, gray and tan, dry, firm, moderate cementation, flat to subrounded, grass lense (fill), transition to gray at 26'
28 - 30			(28 - 30) Silty SAND, iron-rich, dry, soft, weak cementation, subrounded, sharp contact
30 - 40	10.0/10.0	SC	(30 - 53) SAND, gray with small streaks and iron at 32', moist to wet, soft, moderate plasticity at 30', transition to low plasticity at 40', minor clay content
40 - 50	10.0/10.0		
50 - 60	10.0/10.0	CL	(53 - 60) Silty CLAY, gray, dry, firm, moderate cementation, dry, flat, transition to very hard gray/dark gray clay at 56'

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-35) Casing, 2" Sch 40 FJT PVC
(35-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-31') Grout
(31'-33') Bentonite pellets
(33'-60') 20/40 sand

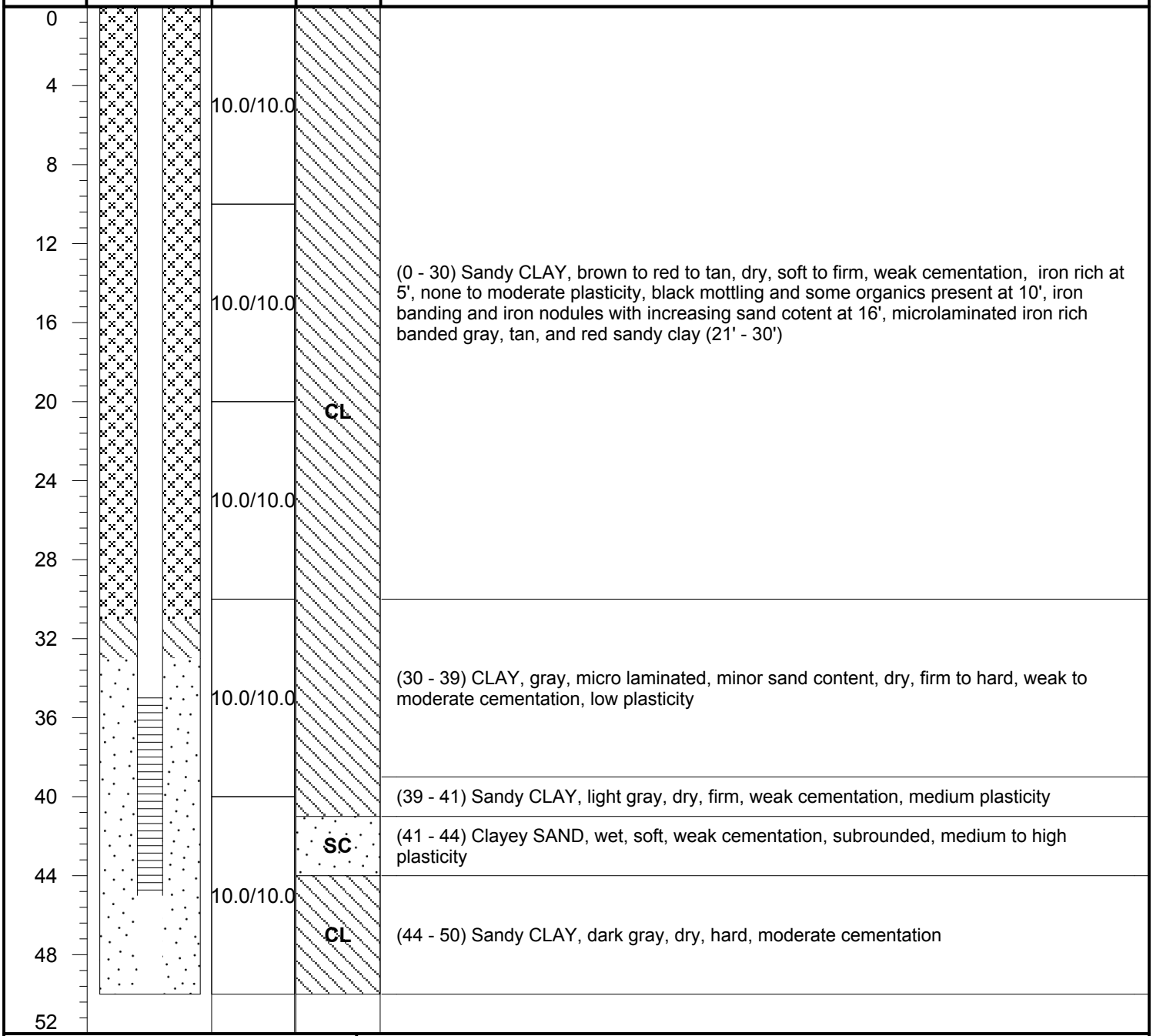
Luminant

Log of Boring: PDP-23

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/10/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-35) Casing, 2" Sch 40 FJT PVC
(35-45) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-31') Grout
(31'-33') Bentonite pellets
(33'-45') 20/40 sand

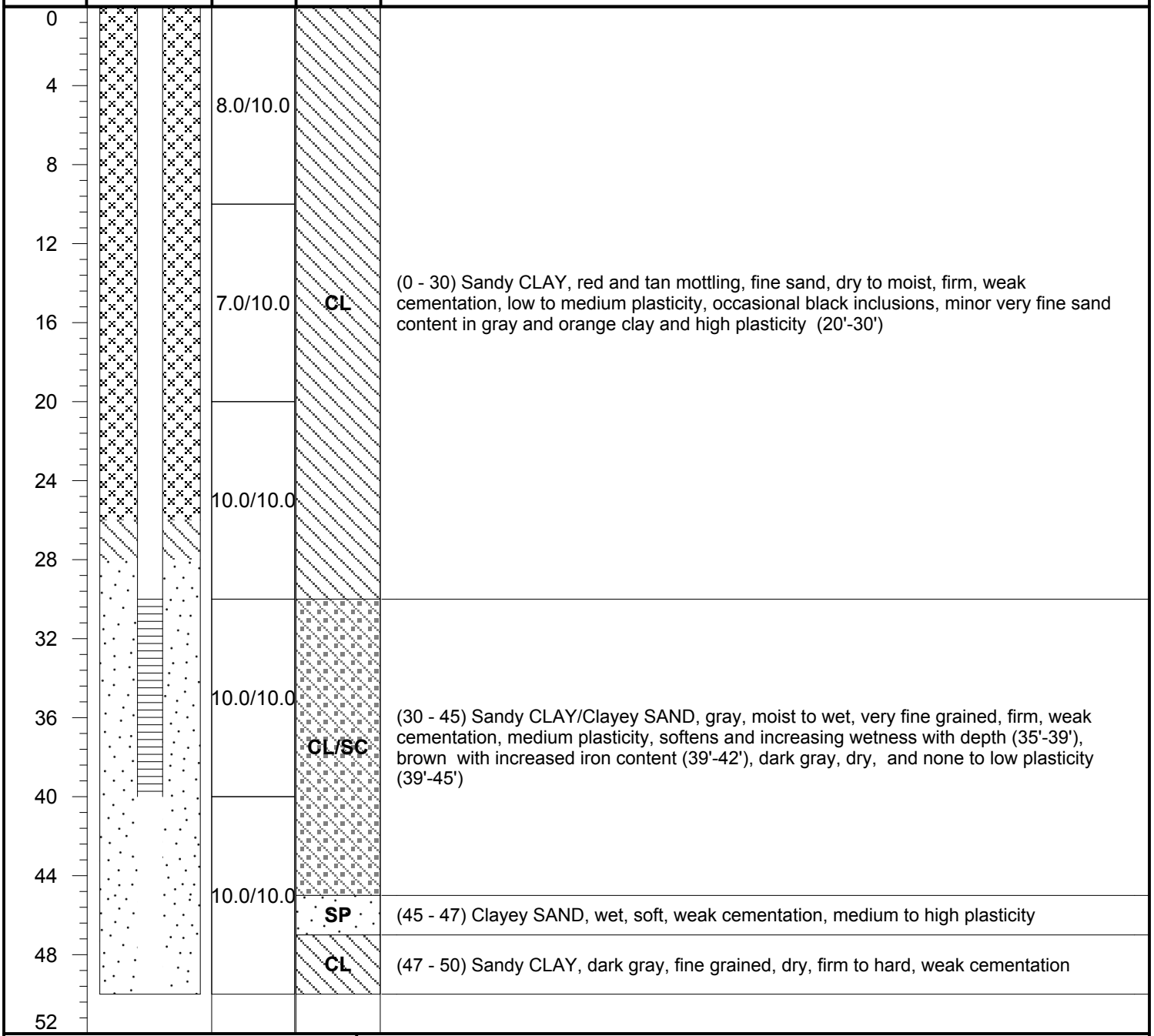
Luminant

Log of Boring: PDP-24

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/11/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

Pastor, Behling & Wheeler, LLC
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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-30) Casing, 2" Sch 40 FJT PVC
(30-40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-26') Grout
(26'-28') Bentonite pellets
(28'-40') 20/40 sand

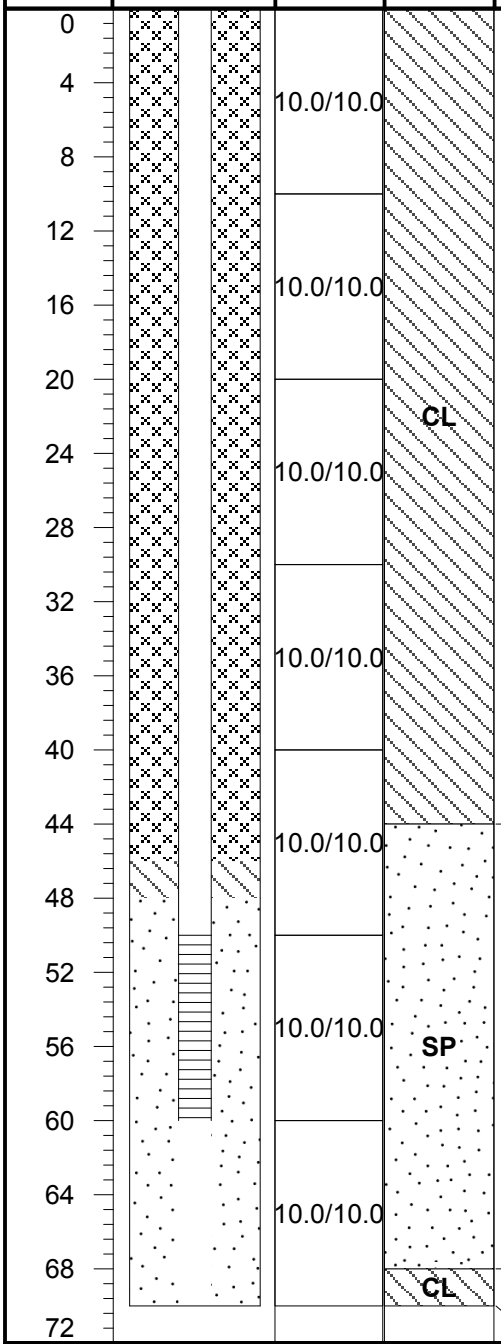
Luminant

Log of Boring: PDP-25

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/11/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	70
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Lithologic Description

(0 - 44) Sandy CLAY, red to gray and tan, very fine grained, dry to moist, firm, low to medium plasicity, weak to moderate cementation, micro laminated, minor organics, variable sand content with depth, high plasticity and very low sand content (22'-23'), higher sand content and high iron content with occasional subrounded pebbles (27'-30'), red, orange, tan, and gray mottling (30'-44')

(44 - 68) Clayey SAND, gray, moist, soft to firm, minor orange streaking, low plasticity, weak cementation, subrounded, minor wet and soft clay zone (62'-64')

(68 - 70) CLAY, black, minor silt, dry, very hard, moderate cementation, smooth shiny surface when fractured

PBW

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2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-50) Casing, 2" Sch 40 FJT PVC
(50-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-46') Grout
(46'-48') Bentonite pellets
(48'-60') 20/40 sand

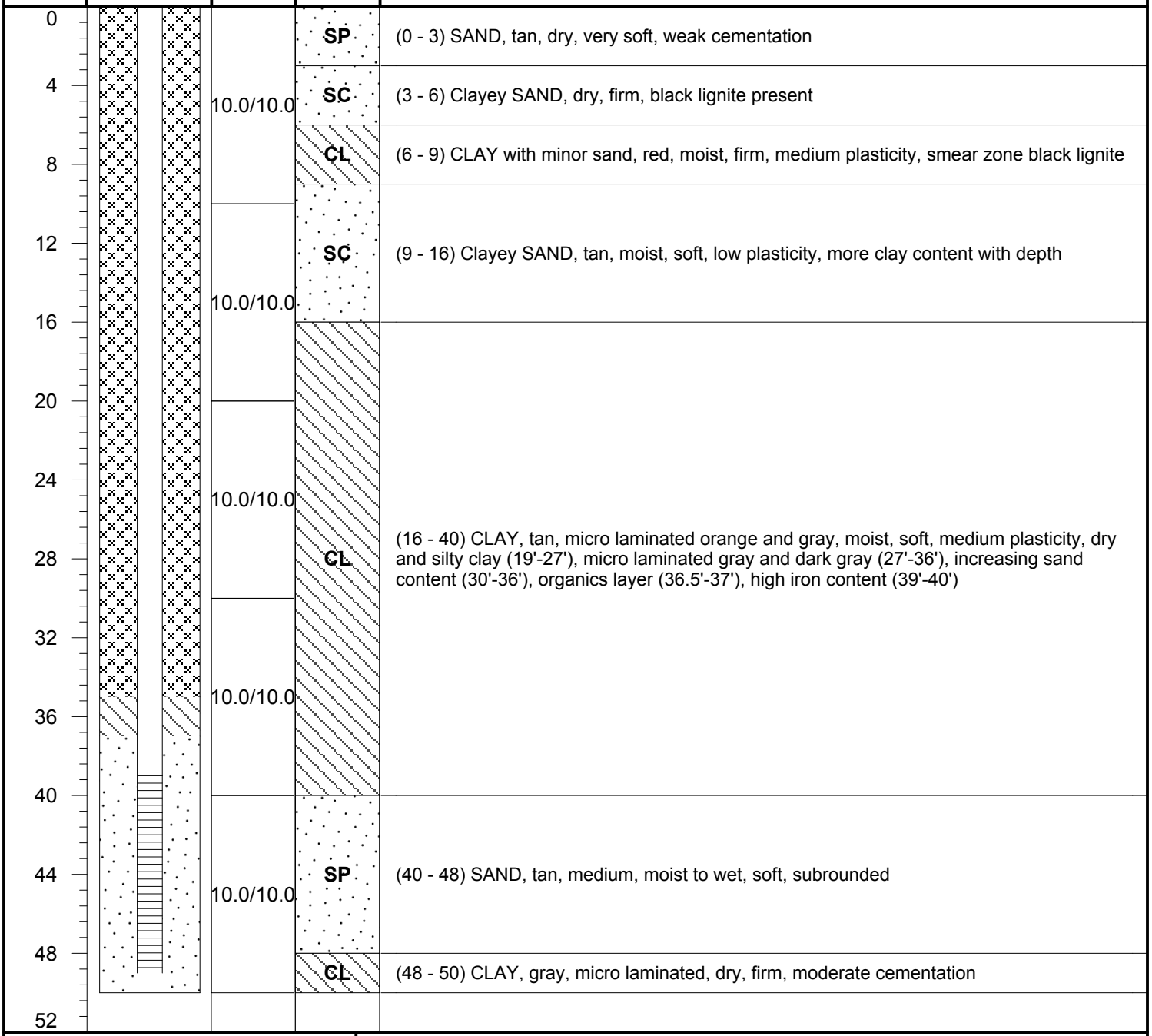
Luminant

Log of Boring: PDP-26

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/9/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-39) Casing, 2" Sch 40 FJT PVC
(39-49) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-35') Grout
(35'-37') Bentonite pellets
(37'-49') 20/40 sand

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-17A
Project Name:	Martin Lake SES	Date Drilled:	October 1, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	384.63' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	387.53' msl	Depth to Water/Date:	26.62' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	360.91' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA	10, 20, 30, 40, 50			See MW-17B boring log for Lithologic Description	10.0, 20.0, 30.0, 40.0, 50.0	Cement/ Concrete Well Cover; Bentonite Pellets to 25'; 30' Casing; 20' Screen with 2" End Cap; Sand Backfill of Annular Space from 25' to 47'
								The boring was terminated and the well was set at 47' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.		

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-17B
Project Name:	Martin Lake SES	Date Drilled:	October 1, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	384.63' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	387.60' msl	Depth to Water/Date:	30.52' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	357.08' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA		CT	NA		GM		GRAVELLY road base		Cement/ Concrete Well Cover
		50			5	SC		Dry, dense, reddish-brown, CLAYEY SAND	5.0	Bentonite Pellets to 57'
		50						-stringer of reddish-brown, fine-grained SAND		
					10	CL		Dry, very stiff, reddish-brown, SANDY CLAY	10.0	
		70						-moist ▽		
						SM		Wet, dense, reddish-brown, fine-grained SAND		62' Casing
					15	CL		Moist, very stiff, light gray, CLAY with iron staining	15.0	
		90				CL		Moist, very stiff, brown and light gray, SILTY CLAY		
					20	SC		Wet, loose, reddish-brown CLAYEY SAND	20.0	
		90				CL		Wet, medium stiff, reddish-brown and gray, SILTY CLAY		
								-with some iron deposits		
					25	ML		Wet, soft, reddish-brown and gray, CLAYEY SILT	25.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-17B
Date Drilled: October 1, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		90			30			▽ -less CLAY	30.0	
		90			35			-more CLAY -heavy iron deposits		
						ML		Dry, very stiff, gray, CLAYEY SILT	35.0	
		100			40	ML		Moist to wet, dense, gray, SILT	40.0	
		90			45			-hard, shaley	45.0	
		100			50			-stringer of coal (4") -stringer of very dense, gray, SILTY SAND (fine-grained SAND)	50.0	
		80			55			-loose/soft with some CLAY -hard, shaley	55.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-17B
Date Drilled: October 1, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		100			60			-stringer of coal (4")	60.0	20' Screen with 2" End Cap
		100			65			-dense, not shaley, low CLAY	65.0	
		100			70				70.0	Sand Backfill of Annular Space from 57' to 79'
		100			75				75.0	
		100			80			The boring was terminated and the well was set at 79' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	80.0	

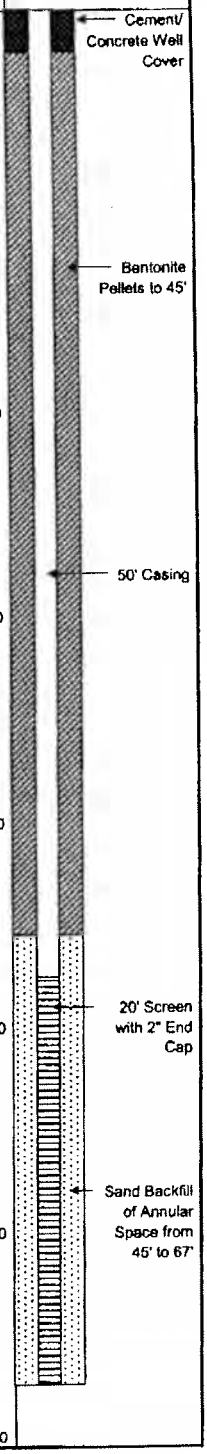
GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-18A
Project Name:	Martin Lake SES	Date Drilled:	October 2, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	410.83' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	414.43' msl	Depth to Water/Date:	43.17' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	371.26' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth
NA	NA	NA	CT	NA	10, 20, 30, 40, 50, 60, 70			See MW-18B boring log for Lithologic Description	10.0, 20.0, 30.0, 40.0 ▽, 50.0, 60.0, 70.0
								The boring was terminated and the well was set at 67' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	

Well Diagram



GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-18B
Project Name:	Martin Lake SES	Date Drilled:	October 2, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	410.83' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	414.25' msl	Depth to Water/Date:	44.41' BTOC/10-10-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	369.84' msl/10-10-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	30	CT	NA	5	SM		Dry, medium dense, brown, fine-grained SAND -light brown -stringer of coal combustion by-product	5.0	Cement/ Concrete Well Cover Bentonite Pellets to 73'
		10			10	SC		CLAYEY SAND fill with partially burned lumber, tin -reddish brown	10.0	78' Casing
		70			15			-no waste -brown, no CLAY -stringer of stiff, brown, SILTY CLAY		
		100			20	SM		Dry, dense, reddish-brown, very fine-grained SAND	15.0	
		60			25			-with some light gray and brown -loose, light gray and brown	20.0 25.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388 | Boring/Well Number: MW-18B

Project Name: Martin Lake SES | Date Drilled: October 2, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		100			30			-medium dense -dense	30.0	
		60			35			-stringer of very dense, light gray, CLAYEY SILT -wet ▽	35.0	
		100			40	CL		Moist, very stiff, brown and gray SILTY CLAY	40.0	
		100			45			-wet, soft, reddish-brown and gray -interbedded layers of CLAY/SILT	45.0	
		90			50			-moist -medium stiff	50.0	
		100			55	ML		Wet, soft, brown CLAYEY SILT		
						ML		Moist, dense, gray, SILT ▽	55.0	

BORING/WELL CONSTRUCTION LOG

GREEN STAR ENVIRONMENTAL

Project Number: 08-1388
Project Name: Martin Lake SES

Boring/Well Number: MW-18B
Date Drilled: October 2, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		100			60			-shaley	60.0	
		100			65			-not shaley	65.0	
		100			70	SP		Wet, medium dense, gray, fine-grained SAND	70.0	
		100			75	ML		Dry, dense, gray, SILT (shaley)	75.0	20' Screen with 2" End Cap
		100			80	SP		-wet Wet, medium dense, gray, fine-grained SAND -interbedded layers of shaley SILT and wet SAND (4")	80.0	Sand Backfill of Annular Space from 73' to 95'
		100			85				85.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-18B
Date Drilled: October 2, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
								-fewer/narrower SAND layers		
					90				90.0	
					95			The boring was terminated and the well was set at 95' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	95.0	

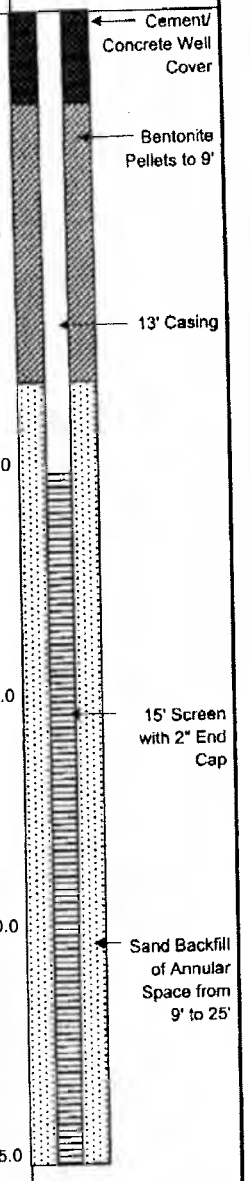
GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-19
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	367.84' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	371.23' msl	Depth to Water/Date:	13.89' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	357.34' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth
NA	NA	90	CT	NA		SC		Moist, medium dense, reddish-brown, CLAYEY SAND (fine-grained SAND)	
						CL		Moist, soft, reddish-brown, SANDY CLAY	
						SP		Moist, loose, reddish-brown, fine-grained SAND	
					5			-gray	5.0
		60				CL		Moist to wet, soft, brown, SANDY CLAY (fine-grained SAND)	
								-stiff	
					10			-light gray ▽	10.0
		100				CL		Moist, very stiff, light gray, SILTY CLAY	
						SC		Moist, dense, gray and reddish-brown, CLAYEY SAND (fine-grained SAND) ▽	15.0
					15	SP		Wet, loose, light gray and reddish-brown, fine-grained SAND	
		70						-medium dense	
						SC		Wet, medium dense, light gray and reddish-brown, CLAYEY SAND (fine-grained SAND)	20.0
					20			-stringer of dense	
		100						-stringer of dense	
						ML		Moist, very stiff, gray CLAYEY SILT with some iron staining	25.0
					25			The boring was terminated and the well was set at 25' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	

Well Diagram



GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-20A
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	395.95' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	398.34' msl	Depth to Water/Date:	29.19' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	369.65' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA	10			See MW-20B boring log for Lithologic Description	10.0	Cement/ Concrete Well Cover; Bentonite Pellets to 19'; 24' Casing
					20				20.0	20' Screen with 2" End Cap
					30				30.0	Sand Backfill of Annular Space from 19' to 41'
					40				40.0	
								The boring was terminated and the well was set at 41' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.		

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-20B
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA / FA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT / FA	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	395.95' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	398.94' msl	Depth to Water/Date:	36.42' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	362.52' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	100	CT	NA	5	SP		Moist, loose, brown, SILTY SAND (fine-grained) -stringer of coal combustion by-product -stringer of moist, soft, light gray to brown SILTY CLAY -with some CLAY	5.0	Cement/ Concrete Well Cover
		100			10	SP		Moist, loose, light gray, fine-grained SAND		Bentonite Pellets to 42'
						CL		Moist, medium stiff, brown, SANDY CLAY (fine-grained SAND) -light gray and reddish-brown ▽	10.0	
		100			15	SP		Wet, medium dense, reddish-brown, fine-grained SAND -with some light gray -light gray and reddish-brown	15.0	48' Casing
		100			20	CL		Moist, stiff, light gray, reddish-brown, and brown, SANDY CLAY (fine-grained SAND) -stringer of hard -no brown	20.0	
		100			25	SC		Moist, dense, light gray to reddish-brown, CLAYEY SAND (fine-grained SAND) -gray	25.0	
		100			30	CL		Moist to wet, stiff, gray, SILTY CLAY	30.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

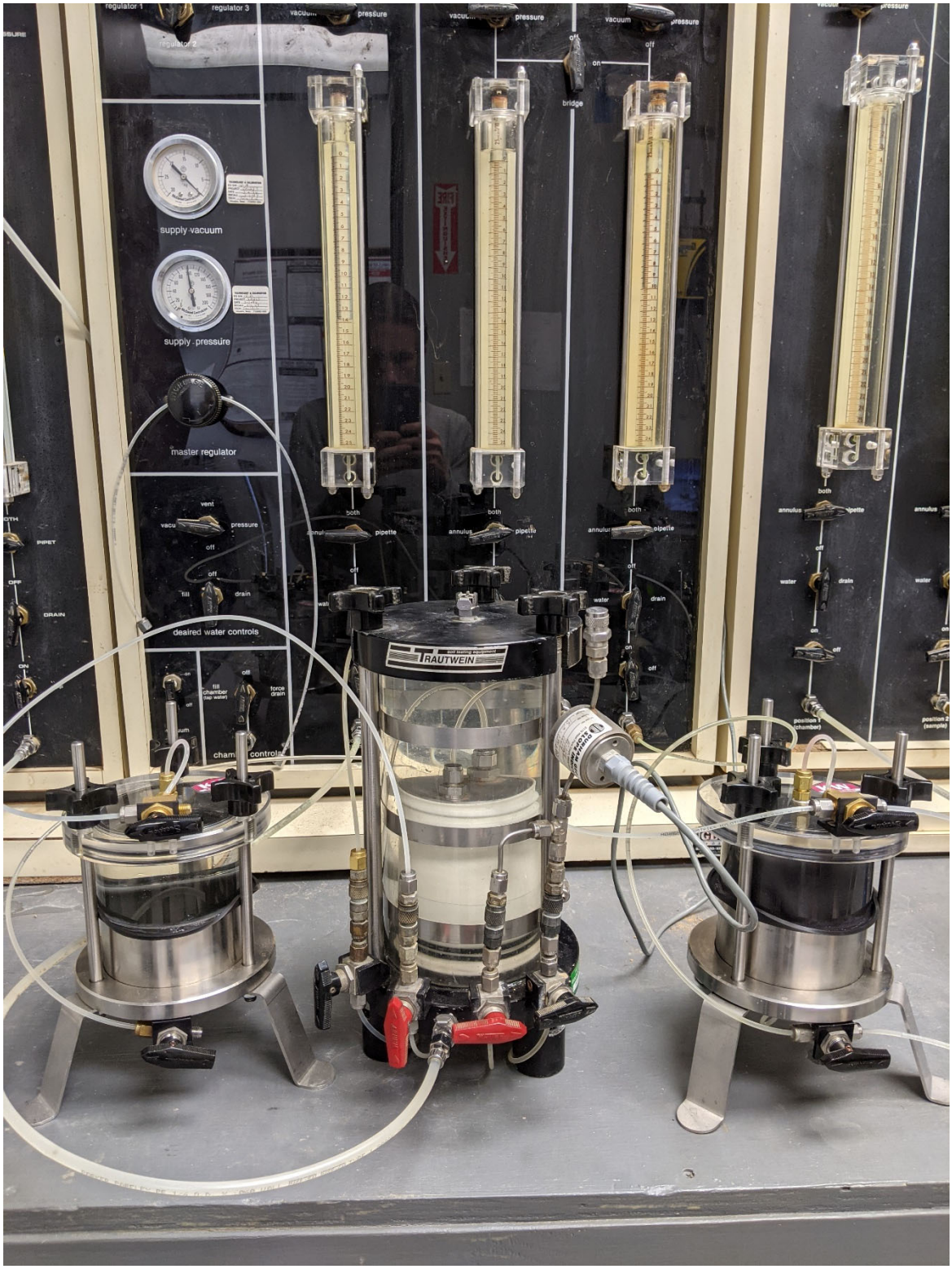
Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-20B
Date Drilled: September 30, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
								-hard		
		100				CL		Moist, hard, gray and reddish-brown, SILTY CLAY ▽		
								-stringer of hard red SANDSTONE GRAVEL (coarse)		
					35	SP		Wet, medium dense, reddish-brown, fine-grained SAND	35.0	
		60						-stringer of wet, soft, brown, CLAY with some angular, red GRAVEL		
					40			-stringer of wet, soft, dense, gray, CLAYEY SAND	40.0	
		100								
					45	ML		Dry, medium stiff, dark to light gray, CLAYEY SILT	45.0	
		100								
					50			-stringer of moist, medium dense, gray, fine-grained SAND	50.0	20' Screen with 2" End Cap
								-stringer of hard (SHALEY)		
		100						-stringer of coal		
					55				55.0	
		90								
			FA		60			Refusal at 59' bgs, advanced to 65' bgs with flight auger instead of sample tube.	60.0	Sand Backfill of Annular Space from 42' to 65'
		0								
					65			The boring was terminated and the well was set at 65' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	65.0	

APPENDIX B

Photograph of Modified ASTM D7100 Hydraulic Conductivity Testing Apparatus

Appendix B
Photograph of Modified ASTM D7100 Hydraulic Conductivity Testing Apparatus



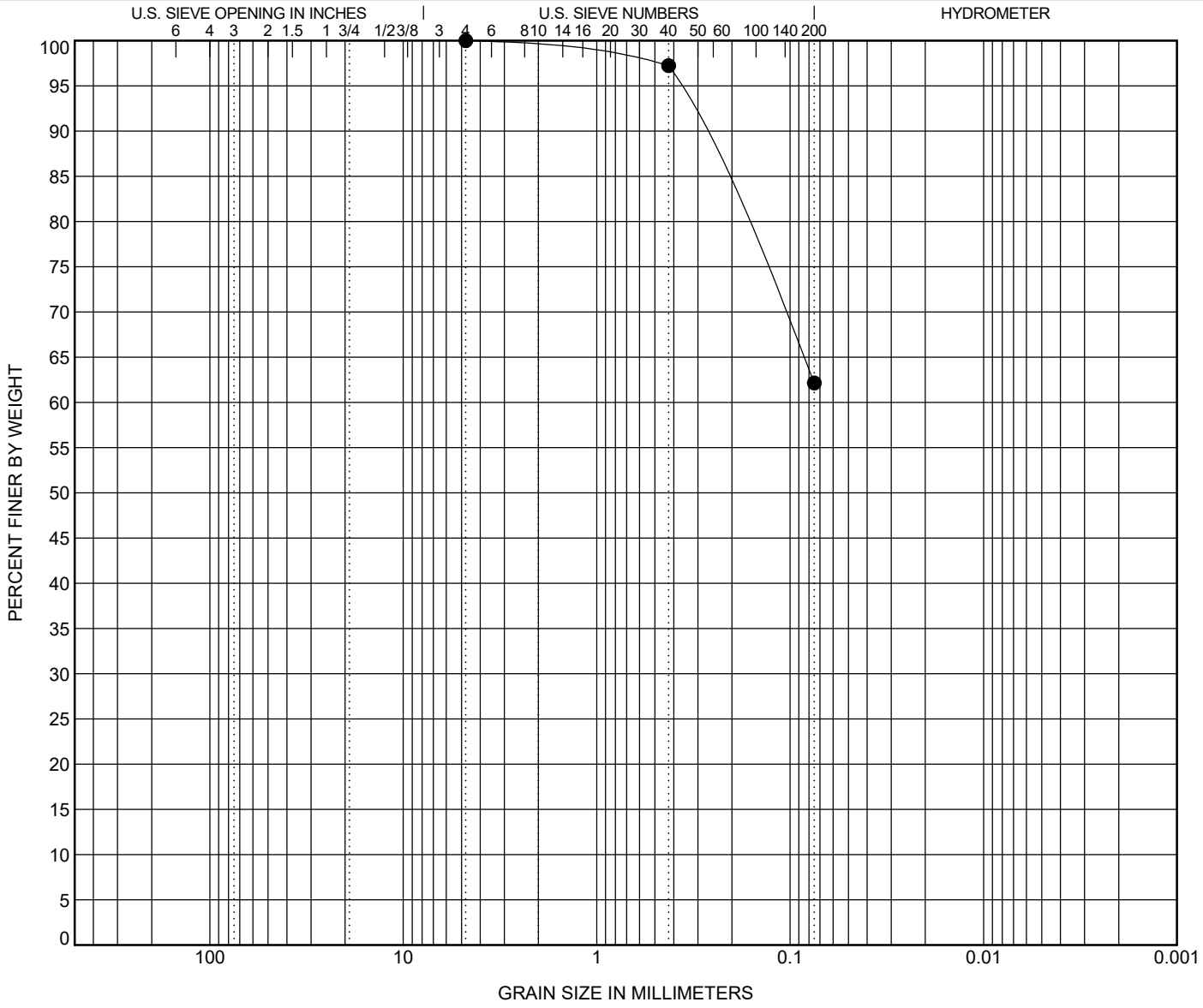
APPENDIX C

PDP-5 CCL - Geotechnical Laboratory Reports

GRAIN SIZE DISTRIBUTION
ASTM D1140

CLIENT Luminant (Vistra Energy) **PROJECT NAME** Martin Lake PDP-5

PROJECT NUMBER 20142271 **PROJECT LOCATION**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	Method	Proced.	Comp. Sieve?	Separ. Sieve	Soak Time	Prior Test.?	Test Date	Description	Tech.	Review	Notes
●	LTP-1	0 ft	SANDY LEAN CLAY (CL)	B	Oven	No		16 hrs.	No	10/01/2021		MR	JBF	

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	LTP-1	0 ft	4.75				0.0	37.9	62	

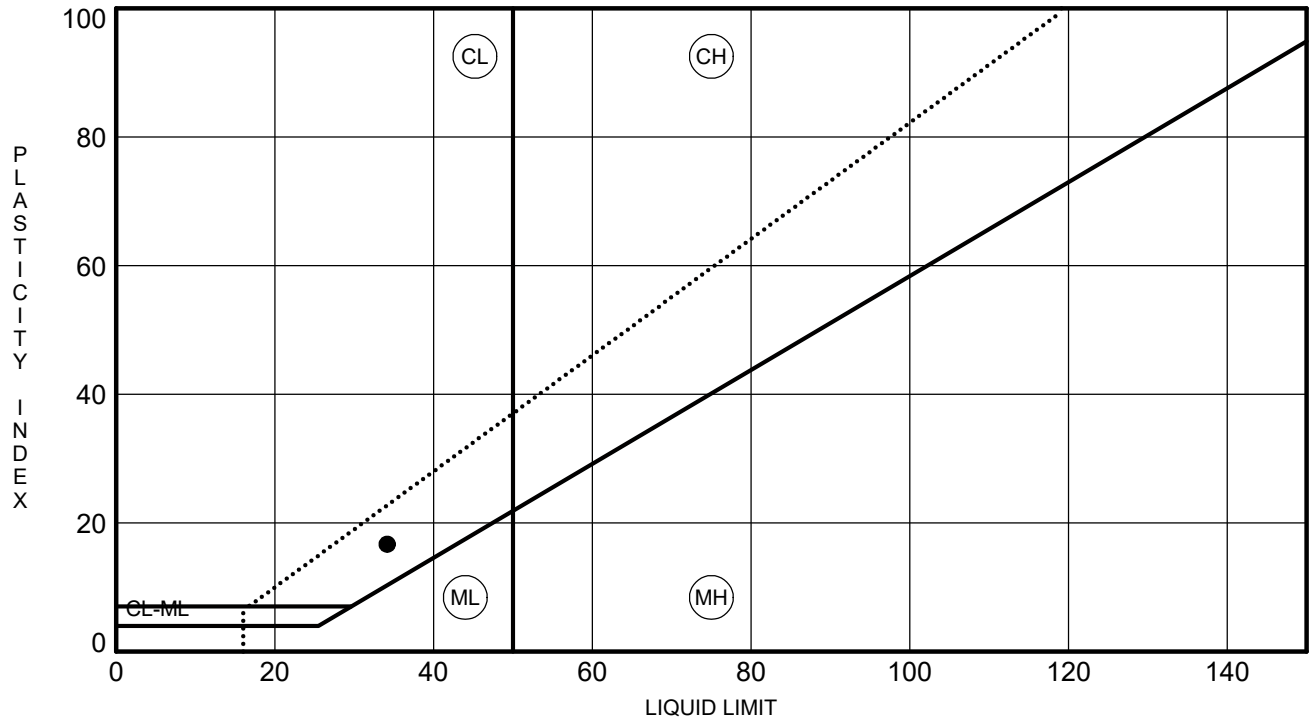
SIEVE_2016 (FEET) - GINT STD US LAB.GDT - 11/3/21 14:45 - L:\2021- 2021 FILE FOLDERS\MARTIN LAKE PDP-5_LTP\LONG TERM PERM2021.GPJ

GOLDER
MEMBER OF WSP

ATTERBERG LIMITS RESULTS
ASTM D4318
LL Machine Type:Mechanical
Plastic Limit Type:Hand Rolled
Grooving Tool Type:Plastic

CLIENT Luminant (Vistra Energy) **PROJECT NAME** Martin Lake PDP-5

PROJECT NUMBER 20142271 **PROJECT LOCATION**



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification	Max Grain Size	% RET. #40	As Rec. WC %	Method	Date Tested	Prep. Type	Tech.	Review	Description	Notes
●	LTP-1	0 ft	34	17	17	62	SANDY LEAN CLAY (CL)	0.425 mm	2.8%	10.61%	B	09/29/2021	Wet	MR	JBF	Tan	

ATTERBERG LIMITS_2016 - GINT STD US LAB.GDT - 11/3/21 14:48 - L:\2021- 2021 FILE FOLDERS\MARTIN LAKE PDP-5_LTP\LONG TERM PERM2021.GPJ

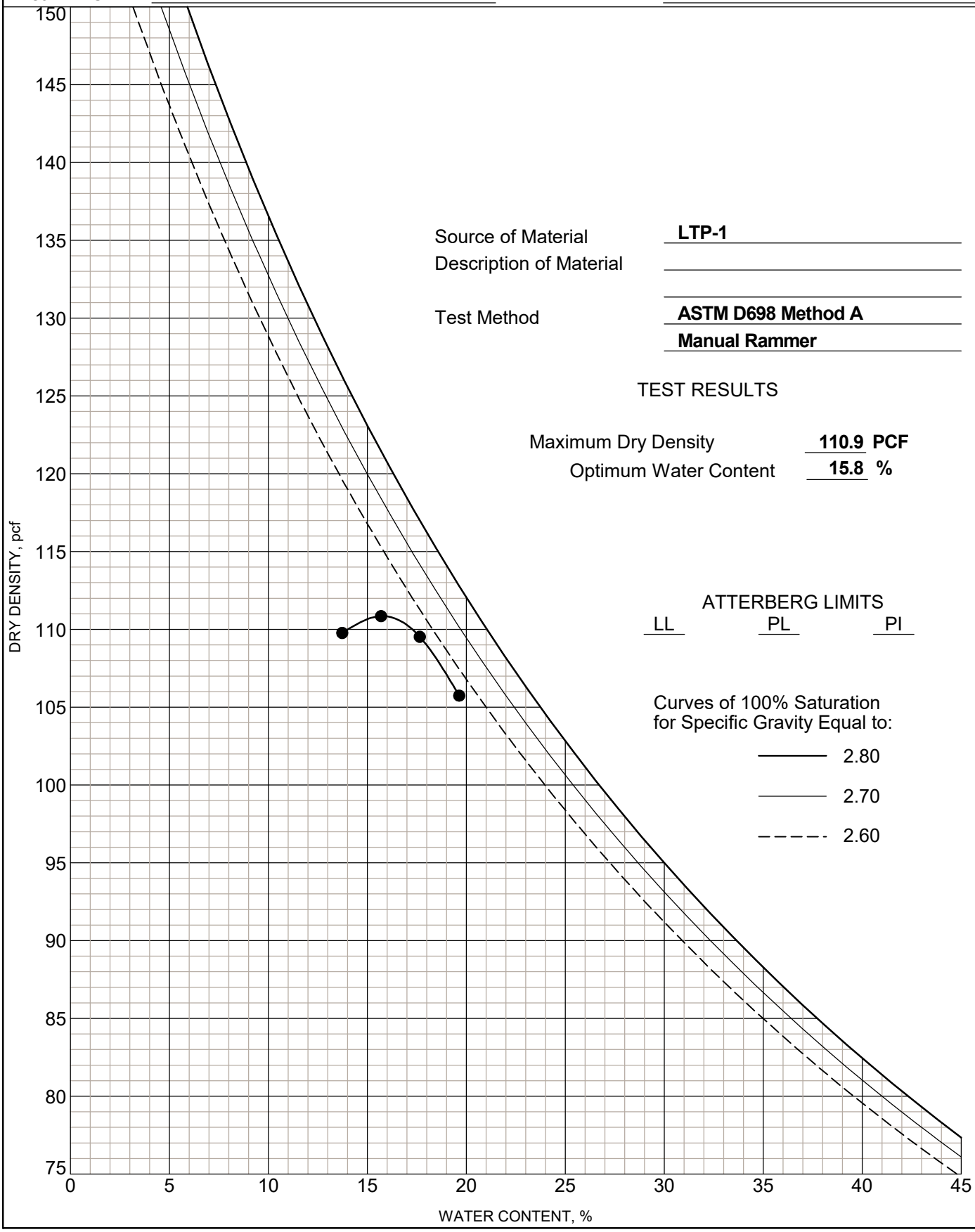
MOISTURE-DENSITY RELATIONSHIP

GOLDER
MEMBER OF WSP

TECHNICIAN:MR
DATE PERFORMED:09/25/2021
COLOR:Lt. Brown
NATURAL MOISTURE %: 10.60%

CLIENT Luminant (Vistra Energy) **PROJECT NAME** Martin Lake PDP-5

PROJECT NUMBER 20142271 **PROJECT LOCATION**



Source of Material **LTP-1**
Description of Material

Test Method **ASTM D698 Method A**
Manual Rammer

TEST RESULTS

Maximum Dry Density **110.9** **PCF**
Optimum Water Content **15.8** **%**

ATTERBERG LIMITS

LL	PL	PI

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80
2.70
2.60

COMPACTION - GINT STD US LAB.GDT - 9/27/21 10:51 - L:\2021- 2021 FILE FOLDERS\LONG TERM PERM SAMPLE\LONG TERM PERM2021.GPJ

APPENDIX D

PDP-5 Water Sample Laboratory Analytical Reports

Surface Water
~~Groundwater~~ Sample Collection

Page ___ of ___

GOLDER

Project/Phase	20142271	**Equipment Decon**	☑ Dedicated equipment	**Depth to Water**	/ ft. BMP
Site Location	PDP-5		☐ Decon between locations	**Casing Stickup**	/ ft.
Date	10/28/21	**Reference Point**	☐ Top of casing	**Depth to Water**	/ ft. BGL
~~**MW ID**~~	PDP-5	**Location**	☐ Other ___	**Total MW Depth**	/ ft. BGL
Sample ID	PDP-5	**Water Quality**		**MW Diameter**	/ inches
Pump	☐ Waterra ☐ Submersible	**Meter Model**	Horiba	**MW Volume**	/ gallons
	☑ Peristaltic ☐ Bladder	**Unit Number**		**Pump Intake Depth**	1' ft. BGL

Standard volume capacity of monitoring wells: Schedule 40 PVC (1-inch OD, 0.04 gallons/foot; 2-inch OD, 0.16 gallons/foot; 4-inch OD, 0.65 gallons/foot)

Time	Purge Rate (L/min)	Cumulative Purge Volume (L)	Depth to Water (ft)	Temp (°C) ☐ NM	pH ☐ NM	Conductivity (µS/m or mS/cm) ☐ not measured	Dissolved Oxygen (mg/L) ☐ not measured	Redox Potential (mV) ☐ not measured	Turbidity (NTU) ☐ NM
11:10				18.77	6.28	9.26	6.22	55	0

* 0-1000 winds conditions caused sediments to cont. be disturbed near bank

Purging was completed based on: ☑ stabilization of water quality parameters ☐ removal of three well volumes ☐ removal of at least one half well volume (low yield well)
* turbidity never stabilized due to high winds

Bottles Collected				Filtration	Preserved	Notes and Observations
Time	Volume	Composition (G / P)	No.	(10µm / 45µm)	(type)	(quality control sample, other)
11:10	2 1L bottles 1 250 mL 2 500 mL		5	☐ filtered ☑ unfiltered	None	
				☐ filtered ☐ unfiltered		

Notes: record time at which purging is started. For low flow sampling, recommended stabilization criteria: temp ± 0.5°C; pH ± 0.1 units; conductivity ± 3%; DO ± 1 mg/L; ORP ± 10 mV; for at least three successive measurements that are made every 3-5 minutes with <1 foot of stable draw down.

Unless otherwise noted, groundwater sample collection was completed in accordance with the applicable requirements of Golder's Quality Assurance Program and Standard Operating Procedure ☐ 9 Conventional Groundwater Sample Collection ☐ 10 Low Flow Groundwater Sample Collection.

Field Team Leader Daniel Stagg
name

signature

November 04, 2021

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2110266

RE: Martin Lake PDP5

Dear Will Vienne:

DHL Analytical, Inc. received 1 sample(s) on 10/29/2021 for the analyses presented in the following report.

Revision Number 1 for Work Order 2110266: This revision consists of adding Alkalinity to sample, per the client's request. Please replace the original Data Report with this revision.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-21-27

Table of Contents

DHL ANALYTICAL

2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: *www.dhlanalytical.com*
E-Mail: *login@dhlanalytical.com*

ACCREDITING AUTHORITY nelap — DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA

№ 86962

CHAIN-OF-CUSTODY

CLIENT: Golder Associates Inc.
ADDRESS: 5416 Plaza Drive, Texarkana, TX 75503
PHONE: 903-794-0625 FAX/E-MAIL:
DATA REPORTED TO: Pat Behling
ADDITIONAL REPORT COPIES TO:

DATE: PAGE 1 OF 1
PO #: 20142271 DHL WORK ORDER #: 2110266
PROJECT LOCATION OR NAME: Martin Lake PDP5
CLENT PROJECT #: 20142271 COLLECTOR:

Authorize 5% surcharge for TRRP Report? ❑ Yes ❑ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

ANALYSES: BTEX ❑ MTBE ❑ [METHOD 8021] | TPH 1005 ❑ TPH 1006 ❑ HOLD 1006 ❑ | GRO [METHOD 8015] ❑ DRO [METHOD 8105] ❑ | VOC 8260 ❑ VOC 624 ❑ VOC 8260/5035 ❑ | SVOC 8270 ❑ PAH 8270 ❑ HOLD PAH ❑ SVOC 625 ❑ | 8270 PEST ❑ 625 PEST/PCB ❑ 608 PCB ❑ | 8270 O-P PEST ❑ 8082 PCB ❑ 8270 PCB ❑ | 8321 HERB ❑ T PHOS, AMMONIA ❑ | METALS 6020 ❑ METALS 200.8 ❑ DISS. METALS ❑ | RCRA ❑ TX11 ❑ ___ ❑ | PH ❑ HEX CHROM ❑ ALKALINITY ☒ | CHLORIDE ☑ ANIONS Sulfate ❑ | **TCLP**-SVOC ❑ VOC ❑ COD ❑ | **TCLP**-METALS ❑ PEST ❑ ___ ❑ | RCI ❑ RCRA 8 ❑ HERB ❑ | FLASHPOINT ❑ TX-11 ❑ Pb ❑ | TDS ❑ TSS ❑ DGAS ❑ | % MOISTURE ❑ CYANIDE ❑ | Appendix III | Appendix IV | Cations

Field Sample I.D.	DHL Lab #	Date	Time	Matrix	Container Type	# of Containers	HCl	HNO_3	H_2SO_4 ❑ NaOH ❑	ICE	UNPRESERVED	Analyses	FIELD NOTES
PDP5	01	10/28/21	11:10	W	Plastic	4				✓	✓	Ⓧ (Metals / Diss. Metals), ✓, ✓ ✓ ✓	calcium, magnesium, pottasium, sodium add Alkalinity per V. Viene 11/3/21 (JD) Lab filter 0.45µ per K Starek Dissolved metals JD 10/29/21

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
[signature]	10/28/21 14:00	FedEx
FedEx	10/29/21 1027	[signature]

❑ DHL DISPOSAL @ $5.00 each ❑ Return

TURN AROUND TIME
RUSH ❑ CALL FIRST
1 DAY ❑ CALL FIRST
2 DAY ☑
NORMAL ❑
OTHER ❑ ______
Except radium

LABORATORY USE ONLY:
RECEIVING TEMP: 1.2°C THERM #: 78
CUSTODY SEALS: ❑ BROKEN ☒ INTACT ❑ NOT USED
CARRIER: ❑ LONE STAR ☑ FEDEX ❑ UPS ❑ OTHER
❑ COURIER DELIVERY
❑ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

Eric Lau

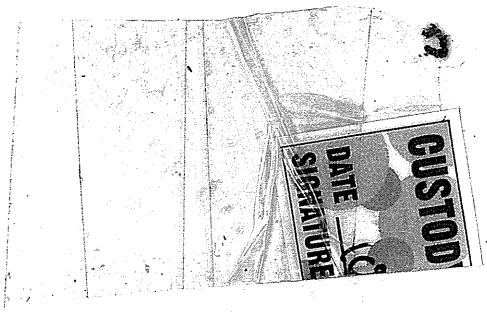
From: John DuPont
Sent: Tuesday, May 28, 2019 11:35 AM
To: Eric Lau
Subject: FW: CCR Analysis

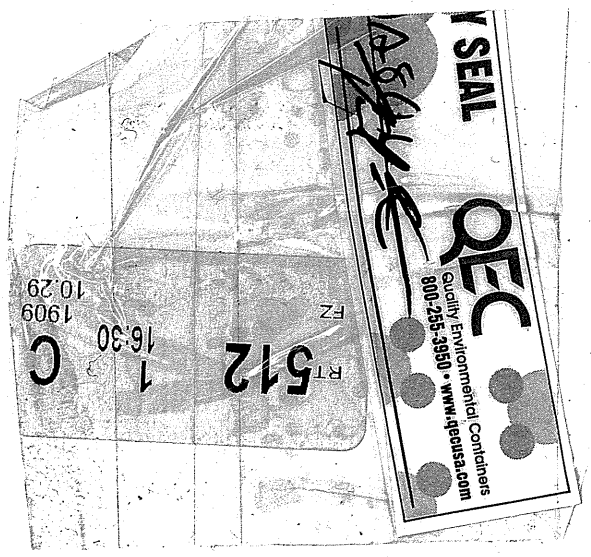
Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

From: Vienne, Will [mailto:William_Vienne@golder.com]
Sent: Tuesday, April 09, 2019 12:48 PM
To: John DuPont <dupont@dhlanalytical.com>
Subject: CCR Analysis





ORIGIN ID:TXKA (903) 794-0628

GOLDER ASSOCIATES
5416 PLAZA DR

TEXARKANA, TX 75503
UNITED STATES US

SHIP DATE: 28OCT21
ACTWGT: 28.05 LB
CAD: 6995122/SSFE2220
DIMS: 23x13x13 IN

BILL THIRD PARTY

Part # 156297-435 RRDW EXP 07/22

TO **RECIEVING DEPT**
DHL ANALYTICAL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664

(512) 388-8229 REF:
INV:
PO: DEPT:

FedEx Express

TRK# 0200 **8124 1057 1909**

FRI - 29 OCT 4:30P
STANDARD OVERNIGHT

A8 BSMA

AHS
78664
TX-US **AUS**

DHL Analytical, Inc.

Sample Receipt Checklist

Client Name **Golder** Date Received: **10/29/2021**

Work Order Number **2110266** Received by: **JMW**

Checklist completed by: _____ 10/29/2021 Reviewed by SH 10/29/2021
Signature | Date | Initials | Date

Carrier name: FedEx 1day

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	**1.2** °C
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH<2 acceptable upon receipt?	Yes ☐	No ☑	NA ☐ LOT # 13171
	Adjusted? yes		Checked by EL
Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt?	Yes ☐	No ☐	NA ☑ LOT #
	Adjusted?		Checked by

Any No response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: Metals portion received with pH > 2.

Corrective Action: pH adjusted to < 2 at Login with HNO3 Lot #14903.

v

Laboratory Name: DHL Analytical, Inc.

Laboratory Review Checklist: Reportable Data

Project Name: Martin Lake PDP5	**LRC Date:** 11/2/2021
Reviewer Name: Angie O'Donnell	**Laboratory Work Order: 2110266**
Prep Batch Number(s): See Prep Dates Report	**Run Batch:** See Analytical Dates Report

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
		Chain-of-Custody (C-O-C)					
R1	OI	**1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	**X**				**R1-01**
		2) Were all departures from standard conditions described in an exception report?			**X**		
R2	OI	**Sample and Quality Control (QC) Identification**					
		1) Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	**X**				
		2) Are all laboratory ID numbers cross-referenced to the corresponding QC data?	**X**				
R3	OI	**Test Reports**					
		1) Were all samples prepared and analyzed within holding times?	**X**				
		2) Other than those results < MQL, were all other raw values bracketed by calibration standards?	**X**				
		3) Were calculations checked by a peer or supervisor?	**X**				
		4) Were all analyte identifications checked by a peer or supervisor?	**X**				
		5) Were sample detection limits reported for all analytes not detected?	**X**				
		6) Were all results for soil and sediment samples reported on a dry weight basis?			**X**		
		7) Were % moisture (or solids) reported for all soil and sediment samples?			**X**		
		8) Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035?			**X**		
		9) If required for the project, TICs reported?			**X**		
R4	O	**Surrogate Recovery Data**					
		1) Were surrogates added prior to extraction?			**X**		
		2) Were surrogate percent recoveries in all samples within the laboratory QC limits?			**X**		
R5	OI	**Test Reports/Summary Forms for Blank Samples**					
		1) Were appropriate type(s) of blanks analyzed?	**X**				
		2) Were blanks analyzed at the appropriate frequency?	**X**				
		3) Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	**X**				
		4) Were blank concentrations < MDL?	**X**				
		5) For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample?			**X**		
R6	OI	**Laboratory Control Samples (LCS):**					
		1) Were all COCs included in the LCS?	**X**				
		2) Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	**X**				
		3) Were LCSs analyzed at the required frequency?	**X**				
		4) Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	**X**				
		5) Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	**X**				
		6) Was the LCSD RPD within QC limits (if applicable)?	**X**				
R7	OI	**Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data**					
		1) Were the project/method specified analytes included in the MS and MSD?	**X**				
		2) Were MS/MSD analyzed at the appropriate frequency?	**X**				
		3) Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		**X**			**R7-03**
		4) Were MS/MSD RPDs within laboratory QC limits?	**X**				
R8	OI	**Analytical Duplicate Data**					
		1) Were appropriate analytical duplicates analyzed for each matrix?	**X**				
		2) Were analytical duplicates analyzed at the appropriate frequency?	**X**				
		3) Were RPDs or relative standard deviations within the laboratory QC limits?	**X**				
R9	OI	**Method Quantitation Limits (MQLs):**					
		1) Are the MQLs for each method analyte included in the laboratory data package?	**X**				
		2) Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	**X**				
		3) Are unadjusted MQLs and DCSs included in the laboratory data package?	**X**				
R10	OI	**Other Problems/Anomalies**					
		1) Are all known problems/anomalies/special conditions noted in this LRC and ER?	**X**				
		2) Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results?	**X**				
		3) Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	**X**				

Laboratory Name: DHL Analytical, Inc.

Laboratory Review Checklist (continued): Supporting Data

Project Name: Martin Lake PDP5	**LRC Date:** 11/2/2021
Reviewer Name: Angie O'Donnell	**Laboratory Work Order: 2110266**
Prep Batch Number(s): See Prep Dates Report	**Run Batch:** See Analytical Dates Report

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial Calibration (ICAL)**					
		1) Were response factors and/or relative response factors for each analyte within QC limits?	X				
		2) Were percent RSDs or correlation coefficient criteria met?	X				
		3) Was the number of standards recommended in the method used for all analytes?	X				
		4) Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		5) Are ICAL data available for all instruments used?	X				
		6) Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):**					
		1) Was the CCV analyzed at the method-required frequency?	X				
		2) Were percent differences for each analyte within the method-required QC limits?	X				
		3) Was the ICAL curve verified for each analyte?	X				
		4) Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3	O	**Mass Spectral Tuning:**					
		1) Was the appropriate compound for the method used for tuning?	X				
		2) Were ion abundance data within the method-required QC limits?	X				
S4	O	**Internal Standards (IS):**					
		1) Were IS area counts and retention times within the method-required QC limits?	X				
S5	OI	**Raw Data (NELAC Section 5.5.10)**					
		1) Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		2) Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual Column Confirmation**					
		1) Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively Identified Compounds (TICs):**					
		1) If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) Results:**					
		1) Were percent recoveries within method QC limits?	X				
S9	I	**Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions**					
		1) Were percent differences, recoveries, and the linearity within the QC limits specified in the method?		X			**S9-01**
S10	OI	**Method Detection Limit (MDL) Studies**					
		1) Was a MDL study performed for each reported analyte?	X				
		2) Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency Test Reports:**					
		1) Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards Documentation**					
		1) Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/Analyte Identification Procedures**					
		1) Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of Analyst Competency (DOC)**					
		1) Was DOC conducted consistent with NELAC Chapter 5 – Appendix C?	X				
		2) Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/Validation Documentation for Methods** (NELAC Chapter 5)					
		1) Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory Standard Operating Procedures (SOPs):**					
		1) Are laboratory SOPs current and on file for each method performed?	X				

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).
3 NA = Not applicable.
4 NR = Not Reviewed.
5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 23-26, 2021. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

11/04/21
Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

DHL Analytical, Inc. **Date:** *04-Nov-21*

CLIENT: Golder
Project: Martin Lake PDP5
Lab Order: 2110266

CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Filtered Metals Analysis
Method SW7470A - Filtered Mercury Analysis
Method E300 - Anions Analysis
Method M2540C - TDS Analysis
Method M4500-H+ B - pH Analysis
Method M2320 B - Alkalinity Analysis

Exception Report R1-01

The samples were received and log-in performed on 10/29/2021. A total of 1 sample was received and analyzed. The sample arrived in good condition and was properly packaged.

Exception Report R7-03

For Anions Analysis, the recovery of Sulfate for the Matrix Spike and Matrix Spike Duplicate (2110266-01 MS/MSD) was slightly below the method control limits. These are flagged accordingly in the QC Summary Report. This anion was within method control limits in the associated LCS. No further corrective action was taken.

For Filtered Metals Analysis, the recoveries of up to five analytes for the Matrix Spike and Matrix Spike Duplicate (2110266-01 MS/MSD) were outside of the method control limits. These are flagged accordingly in the QC Summary Report. These analytes were within method control limits in the associated LCS. No further corrective action was taken.

Exception Report S9-01

For Filtered Metals Analysis, the recovery of Selenium for the Post Digestion Spike (2110266-01 PDS) was below the method control limits. This is flagged accordingly in the QC Summary Report. This analyte was within method control limits in the associated Serial Dilution. No further corrective action was taken.

DHL Analytical, Inc.

Date: *02-Nov-21*

CLIENT: Golder
Project: Martin Lake PDP5
Lab Order: 2110266

Work Order Sample Summary

Lab Smp ID	Client Sample ID	Tag Number	Date Collected	Date Recved
2110266-01	PDP5		10/28/21 11:10 AM	10/29/2021

Lab Order: 2110266
Client: Golder
Project: Martin Lake PDP5

PREP DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Number	Test Name	Prep Date	Batch ID
2110266-01B	PDP5	10/28/21 11:10 AM	Aqueous	M2320 B	Alkalinity Preparation	11/03/21 10:43 AM	102689
	PDP5	10/28/21 11:10 AM	Aqueous	E300	Anion Preparation	11/01/21 11:01 AM	102648
	PDP5	10/28/21 11:10 AM	Aqueous	E300	Anion Preparation	11/01/21 11:01 AM	102648
	PDP5	10/28/21 11:10 AM	Aqueous	E300	Anion Preparation	11/01/21 11:01 AM	102648
	PDP5	10/28/21 11:10 AM	Aqueous	M4500-H+ B	pH Preparation	11/02/21 09:14 AM	102665
	PDP5	10/28/21 11:10 AM	Aqueous	M2540C	TDS Preparation	11/01/21 10:18 AM	102647
2110266-01C	PDP5	10/28/21 11:10 AM	Aqueous	SW3005A	Aq Prep Metals: Dissolved	11/02/21 07:49 AM	102658
	PDP5	10/28/21 11:10 AM	Aqueous	SW3005A	Aq Prep Metals: Dissolved	11/02/21 07:49 AM	102658
	PDP5	10/28/21 11:10 AM	Aqueous	SW7470A	Mercury Aq Prep	11/02/21 08:43 AM	102660

Lab Order: 2110266
Client: Golder
Project: Martin Lake PDP5

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
2110266-01B	PDP5	Aqueous	M2320 B	Alkalinity	102689	1	11/03/21 02:22 PM	TITRATOR_211103A
	PDP5	Aqueous	E300	Anions by IC method - Water	102648	100	11/02/21 10:46 AM	IC2_211101A
	PDP5	Aqueous	E300	Anions by IC method - Water	102648	1	11/01/21 10:55 PM	IC2_211101A
	PDP5	Aqueous	E300	Anions by IC method - Water	102648	10	11/01/21 07:59 PM	IC2_211101A
	PDP5	Aqueous	M4500-H+ B	pH	102665	1	11/02/21 09:53 AM	TITRATOR_211102A
	PDP5	Aqueous	M2540C	Total Dissolved Solids	102647	1	11/01/21 01:30 PM	WC_211101B
2110266-01C	PDP5	Aqueous	SW7470A	Mercury (0.45µ Filtered)	102660	1	11/02/21 12:00 PM	CETAC2_HG_211102A
	PDP5	Aqueous	SW6020B	Metals-ICPMS (0.45µ filtered)	102658	1	11/02/21 11:20 AM	ICP-MS5_211102A
	PDP5	Aqueous	SW6020B	Metals-ICPMS (0.45µ filtered)	102658	100	11/02/21 11:44 AM	ICP-MS4_211102A

DHL Analytical, Inc.

Date: *04-Nov-21*

CLIENT:	Golder	**Client Sample ID:**	PDP5
Project:	Martin Lake PDP5	**Lab ID:**	2110266-01
Project No:	20142271	**Collection Date:**	10/28/21 11:10 AM
Lab Order:	2110266	**Matrix:**	AQUEOUS

Analyses	Result	SDL	RL	Qual	Units	DF	Date Analyzed
METALS-ICPMS (0.45µ FILTERED)		**SW6020B**					Analyst: **SP**
Dissolved Antimony	0.00332	0.000800	0.00250		mg/L	1	11/02/21 11:20 AM
Dissolved Arsenic	0.00352	0.00200	0.00500	J	mg/L	1	11/02/21 11:20 AM
Dissolved Barium	0.0878	0.00300	0.0100		mg/L	1	11/02/21 11:20 AM
Dissolved Beryllium	<0.000300	0.000300	0.00100		mg/L	1	11/02/21 11:20 AM
Dissolved Boron	41.7	1.00	3.00		mg/L	100	11/02/21 11:44 AM
Dissolved Cadmium	<0.000300	0.000300	0.00100		mg/L	1	11/02/21 11:20 AM
Dissolved Calcium	605	10.0	30.0		mg/L	100	11/02/21 11:44 AM
Dissolved Chromium	<0.00200	0.00200	0.00500		mg/L	1	11/02/21 11:20 AM
Dissolved Cobalt	<0.00300	0.00300	0.00500		mg/L	1	11/02/21 11:20 AM
Dissolved Lead	<0.000300	0.000300	0.00100		mg/L	1	11/02/21 11:20 AM
Dissolved Lithium	0.219	0.00500	0.0100		mg/L	1	11/02/21 11:20 AM
Dissolved Magnesium	1020	10.0	30.0		mg/L	100	11/02/21 11:44 AM
Dissolved Molybdenum	0.0963	0.00200	0.00500		mg/L	1	11/02/21 11:20 AM
Dissolved Potassium	75.1	10.0	30.0		mg/L	100	11/02/21 11:44 AM
Dissolved Selenium	1.22	0.00200	0.00500		mg/L	1	11/02/21 11:20 AM
Dissolved Sodium	584	10.0	30.0		mg/L	100	11/02/21 11:44 AM
Dissolved Thallium	0.000793	0.000500	0.00150	J	mg/L	1	11/02/21 11:20 AM
MERCURY (0.45µ FILTERED)		**SW7470A**					Analyst: **JVR**
Dissolved Mercury	<0.0000800	0.0000800	0.000200		mg/L	1	11/02/21 12:00 PM
ANIONS BY IC METHOD - WATER		**E300**					Analyst: **BM**
Chloride	607	30.0	100		mg/L	100	11/02/21 10:46 AM
Fluoride	18.8	1.00	4.00		mg/L	10	11/01/21 07:59 PM
Sulfate	2660	100	300		mg/L	100	11/02/21 10:46 AM
ALKALINITY		**M2320 B**					Analyst: **BM**
Alkalinity, Bicarbonate (As CaCO3)	123	10.0	20.0		mg/L @ pH 4.51	1	11/03/21 02:22 PM
Alkalinity, Carbonate (As CaCO3)	<10.0	10.0	20.0		mg/L @ pH 4.51	1	11/03/21 02:22 PM
Alkalinity, Hydroxide (As CaCO3)	<10.0	10.0	20.0		mg/L @ pH 4.51	1	11/03/21 02:22 PM
Alkalinity, Total (As CaCO3)	123	20.0	20.0		mg/L @ pH 4.51	1	11/03/21 02:22 PM
PH		**M4500-H+ B**					Analyst: **BM**
pH	8.31	0	0		pH Units@18.5°C	1	11/02/21 09:53 AM
TOTAL DISSOLVED SOLIDS		**M2540C**					Analyst: **JS**
Total Dissolved Solids (Residue, Filterable)	9440	50.0	50.0		mg/L	1	11/01/21 01:30 PM

Qualifiers:

ND - Not Detected at the SDL
J - Analyte detected between SDL and RL
B - Analyte detected in the associated Method Blank
DF- Dilution Factor
N - Parameter not NELAP certified
See Final Page of Report for MQLs and MDLs
S - Spike Recovery outside control limits
C - Sample Result or QC discussed in Case Narrative
RL - Reporting Limit (MQL adjusted for moisture and sample size)
SDL - Sample Detection Limit
E - TPH pattern not Gas or Diesel Range Pattern

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC2_HG_211021C

Sample ID: **DCS-102486**	Batch ID: **102486**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **DCS**	Run ID: **CETAC2_HG_211021C**	Analysis Date: **10/21/2021 1:46:02 PM**	Prep Date: **10/21/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.000172	0.000200	0.000200	0	86.0	82	119	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC2_HG_211102A

The QC data in batch 102660 applies to the following samples: 2110266-01C

Sample ID: **MB-102660**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **MBLK**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 11:48:28 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	<0.0000800	0.000200								

Sample ID: **MB-FILTER-102637**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **MBLK**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 11:50:44 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	<0.0000800	0.000200	0							

Sample ID: **LCS-102660**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **LCS**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 11:53:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.00216	0.000200	0.00200	0	108	85	115			

Sample ID: **LCSD-102660**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **LCSD**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 11:55:46 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.00216	0.000200	0.00200	0	108	85	115	0	15	

Sample ID: **2110266-01C MS**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **MS**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 12:02:33 PM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.00189	0.000200	0.00200	0	94.5	80	120			

Sample ID: **2110266-01C MSD**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **MSD**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 12:04:49 PM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.00189	0.000200	0.00200	0	94.5	80	120	0	15	

Sample ID: **2110266-01C SD**	Batch ID: **102660**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **SD**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 12:07:05 PM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	<0.000400	0.00100	0	0				0	10	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC2_HG_211102A

Sample ID: **2110266-01C PDS**	Batch ID: **102660**	TestNo: **SW7470A**		Units:	**mg/L**
SampType: **PDS**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 12:09:21 PM**		Prep Date:	**11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00224	0.000200	0.00250	0	89.6	85	115			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC2_HG_211102A

Sample ID: **ICV-211102**	Batch ID: **R117821**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **ICV**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 11:43:54 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.00399	0.000200	0.00400	0	99.8	90	110			

Sample ID: **CCV1-211102**	Batch ID: **R117821**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **CCV**	Run ID: **CETAC2_HG_211102A**	Analysis Date: **11/2/2021 12:38:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Mercury	0.00201	0.000200	0.00200	0	101	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_210803A

Sample ID: **DCS2-101483** Batch ID: **101483** TestNo: **SW6020B** Units: **mg/L**
SampType: **DCS2** Run ID: **ICP-MS4_210803A** Analysis Date: **8/3/2021 1:21:00 PM** Prep Date: **8/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Calcium	0.278	0.300	0.300	0	92.6	70	130	0	0	
Dissolved Magnesium	0.295	0.300	0.300	0	98.4	70	130	0	0	
Dissolved Potassium	0.307	0.300	0.300	0	102	70	130	0	0	
Dissolved Sodium	0.292	0.300	0.300	0	97.2	70	130	0	0	

Sample ID: **DCS4-101483** Batch ID: **101483** TestNo: **SW6020B** Units: **mg/L**
SampType: **DCS4** Run ID: **ICP-MS4_210803A** Analysis Date: **8/3/2021 1:27:00 PM** Prep Date: **8/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	0.0315	0.0300	0.0300	0	105	70	130	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: **ICP-MS4_211102A**

The QC data in batch 102658 applies to the following samples: 2110266-01C

Sample ID: **MB-102658**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **MBLK**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:34:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	<0.0100	0.0300								

Sample ID: **MB-102637-FILTER**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **MBLK**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:36:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	<0.0100	0.0300								

Sample ID: **LCS-102658**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **LCS**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:38:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	0.204	0.0300	0.200	0	102	80	120			

Sample ID: **LCSD-102658**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **LCSD**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:40:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	0.204	0.0300	0.200	0	102	80	120	0.391	15	

Sample ID: **2110266-01C SD**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **SD**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:46:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	41.4	15.0	0	41.6				0.567	20	
Calcium	587	150	0	605				3.14	20	
Magnesium	976	150	0	1020				3.93	20	
Potassium	73.8	150	0	75.1				1.75	20	
Sodium	559	150	0	584				4.34	20	

Sample ID: **2110266-01C PDS**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **PDS**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:48:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	57.5	3.00	20.0	41.7	79.2	75	125			
Calcium	1090	30.0	500	605	96.7	75	125			
Magnesium	1460	30.0	500	1020	88.4	75	125			
Potassium	558	30.0	500	75.1	96.6	75	125			
Sodium	1050	30.0	500	584	92.4	75	125			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_211102A

Sample ID: **2110266-01C MS**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **MS**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:55:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	40.1	3.00	0.200	41.7	-778	75	125			S

Sample ID: **2110266-01C MSD**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **MSD**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:57:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	40.7	3.00	0.200	41.7	-462	75	125	1.56	15	S

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_211102A

Sample ID: **ICV-211102**	Batch ID: **R117825**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **ICV**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 10:51:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	0.0969	0.0300	0.100	0	96.9	90	110			
Dissolved Calcium	2.53	0.300	2.50	0	101	90	110			
Dissolved Magnesium	2.45	0.300	2.50	0	98.1	90	110			
Dissolved Potassium	2.50	0.300	2.50	0	100	90	110			
Dissolved Sodium	2.45	0.300	2.50	0	98.0	90	110			

Sample ID: **LCVL-211102**	Batch ID: **R117825**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 10:57:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	0.0199	0.0300	0.0200	0	99.4	80	120			
Dissolved Calcium	0.0922	0.300	0.100	0	92.2	80	120			
Dissolved Magnesium	0.104	0.300	0.100	0	104	80	120			
Dissolved Potassium	0.105	0.300	0.100	0	105	80	120			
Dissolved Sodium	0.103	0.300	0.100	0	103	80	120			

Sample ID: **CCV1-211102**	Batch ID: **R117825**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS4_211102A**	Analysis Date: **11/2/2021 11:59:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Boron	0.213	0.0300	0.200	0	107	90	110			
Dissolved Calcium	5.20	0.300	5.00	0	104	90	110			
Dissolved Magnesium	5.29	0.300	5.00	0	106	90	110			
Dissolved Potassium	5.16	0.300	5.00	0	103	90	110			
Dissolved Sodium	5.08	0.300	5.00	0	102	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211101A

Sample ID: **DCS1-102615**	Batch ID: **102615**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **DCS**	Run ID: **ICP-MS5_211101A**	Analysis Date: **11/1/2021 10:40:00 AM**	Prep Date: **10/29/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.00115	0.00250	0.00100	0	115	70	130	0	0	
Dissolved Beryllium	0.000558	0.00100	0.000500	0	112	70	130	0	0	
Dissolved Cadmium	0.000566	0.00100	0.000500	0	113	70	130	0	0	
Dissolved Lead	0.000570	0.00100	0.000500	0	114	70	130	0	0	
Dissolved Thallium	0.000571	0.00150	0.000500	0	114	70	130	0	0	

Sample ID: **DCS2-102615**	Batch ID: **102615**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **DCS2**	Run ID: **ICP-MS5_211101A**	Analysis Date: **11/1/2021 10:43:00 AM**	Prep Date: **10/29/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Calcium	0.314	0.300	0.300	0	105	70	130	0	0	
Dissolved Magnesium	0.313	0.300	0.300	0	104	70	130	0	0	
Dissolved Potassium	0.308	0.300	0.300	0	103	70	130	0	0	
Dissolved Sodium	0.317	0.300	0.300	0	106	70	130	0	0	

Sample ID: **DCS3-102615**	Batch ID: **102615**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **DCS3**	Run ID: **ICP-MS5_211101A**	Analysis Date: **11/1/2021 10:46:00 AM**	Prep Date: **10/29/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Arsenic	0.00502	0.00500	0.00500	0	100	70	130	0	0	
Dissolved Barium	0.00523	0.0100	0.00500	0	105	70	130	0	0	
Dissolved Chromium	0.00562	0.00500	0.00500	0	112	70	130	0	0	
Dissolved Cobalt	0.00529	0.00500	0.00500	0	106	70	130	0	0	
Dissolved Lithium	0.00527	0.0100	0.00500	0	105	70	130	0	0	
Dissolved Molybdenum	0.00512	0.00500	0.00500	0	102	70	130	0	0	
Dissolved Selenium	0.00521	0.00500	0.00500	0	104	70	130	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: **ICP-MS5_211102A**

The QC data in batch 102658 applies to the following samples: 2110266-01C

Sample ID: **MB-102658** Batch ID: **102658** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:07:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	<0.000800	0.00250								
Dissolved Arsenic	<0.00200	0.00500								
Dissolved Barium	<0.00300	0.0100								
Dissolved Beryllium	<0.000300	0.00100								
Dissolved Cadmium	<0.000300	0.00100								
Dissolved Calcium	<0.100	0.300								
Dissolved Chromium	<0.00200	0.00500								
Dissolved Cobalt	<0.00300	0.00500								
Dissolved Lead	<0.000300	0.00100								
Dissolved Lithium	<0.00500	0.0100								
Dissolved Magnesium	<0.100	0.300								
Dissolved Molybdenum	<0.00200	0.00500								
Dissolved Potassium	<0.100	0.300								
Dissolved Selenium	<0.00200	0.00500								
Dissolved Sodium	<0.100	0.300								
Dissolved Thallium	<0.000500	0.00150								

Sample ID: **MB-102637-FILTER** Batch ID: **102658** TestNo: **SW6020B** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:09:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	<0.000800	0.00250								
Dissolved Arsenic	<0.00200	0.00500								
Dissolved Barium	<0.00300	0.0100								
Dissolved Beryllium	<0.000300	0.00100								
Dissolved Cadmium	<0.000300	0.00100								
Dissolved Calcium	<0.100	0.300								
Dissolved Chromium	<0.00200	0.00500								
Dissolved Cobalt	<0.00300	0.00500								
Dissolved Lead	<0.000300	0.00100								
Dissolved Lithium	<0.00500	0.0100								
Dissolved Magnesium	<0.100	0.300								
Dissolved Molybdenum	<0.00200	0.00500								
Dissolved Potassium	<0.100	0.300								
Dissolved Selenium	<0.00200	0.00500								
Dissolved Sodium	<0.100	0.300								
Dissolved Thallium	<0.000500	0.00150								

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211102A

Sample ID: **LCS-102658** Batch ID: **102658** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:12:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.202	0.00250	0.200	0	101	80	120			
Dissolved Arsenic	0.205	0.00500	0.200	0	102	80	120			
Dissolved Barium	0.202	0.0100	0.200	0	101	80	120			
Dissolved Beryllium	0.197	0.00100	0.200	0	98.3	80	120			
Dissolved Cadmium	0.200	0.00100	0.200	0	99.9	80	120			
Dissolved Calcium	5.05	0.300	5.00	0	101	80	120			
Dissolved Chromium	0.202	0.00500	0.200	0	101	80	120			
Dissolved Cobalt	0.201	0.00500	0.200	0	100	80	120			
Dissolved Lead	0.200	0.00100	0.200	0	100	80	120			
Dissolved Lithium	0.197	0.0100	0.200	0	98.3	80	120			
Dissolved Magnesium	5.17	0.300	5.00	0	103	80	120			
Dissolved Molybdenum	0.200	0.00500	0.200	0	99.9	80	120			
Dissolved Potassium	5.26	0.300	5.00	0	105	80	120			
Dissolved Selenium	0.200	0.00500	0.200	0	99.8	80	120			
Dissolved Sodium	5.18	0.300	5.00	0	104	80	120			
Dissolved Thallium	0.201	0.00150	0.200	0	100	80	120			

Sample ID: **LCSD-102658** Batch ID: **102658** TestNo: **SW6020B** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:14:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.204	0.00250	0.200	0	102	80	120	0.740	15	
Dissolved Arsenic	0.204	0.00500	0.200	0	102	80	120	0.572	15	
Dissolved Barium	0.199	0.0100	0.200	0	99.7	80	120	1.53	15	
Dissolved Beryllium	0.198	0.00100	0.200	0	99.2	80	120	0.863	15	
Dissolved Cadmium	0.201	0.00100	0.200	0	100	80	120	0.499	15	
Dissolved Calcium	5.15	0.300	5.00	0	103	80	120	1.79	15	
Dissolved Chromium	0.203	0.00500	0.200	0	101	80	120	0.380	15	
Dissolved Cobalt	0.202	0.00500	0.200	0	101	80	120	0.611	15	
Dissolved Lead	0.200	0.00100	0.200	0	99.8	80	120	0.148	15	
Dissolved Lithium	0.197	0.0100	0.200	0	98.4	80	120	0.087	15	
Dissolved Magnesium	5.24	0.300	5.00	0	105	80	120	1.34	15	
Dissolved Molybdenum	0.200	0.00500	0.200	0	100	80	120	0.124	15	
Dissolved Potassium	5.30	0.300	5.00	0	106	80	120	0.852	15	
Dissolved Selenium	0.200	0.00500	0.200	0	100	80	120	0.403	15	
Dissolved Sodium	5.25	0.300	5.00	0	105	80	120	1.36	15	
Dissolved Thallium	0.200	0.00150	0.200	0	100	80	120	0.326	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211102A

Sample ID: **2110266-01C SD**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **SD**	Run ID: **ICP-MS5_211102A**	Analysis Date: **11/2/2021 11:22:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	<0.00400	0.0125	0	0.00332				0	20	
Arsenic	<0.0100	0.0250	0	0.00352				0	20	
Barium	0.0834	0.0500	0	0.0878				5.12	20	
Beryllium	<0.00150	0.00500	0	0				0	20	
Cadmium	<0.00150	0.00500	0	0				0	20	
Chromium	<0.0100	0.0250	0	0				0	20	
Cobalt	<0.0150	0.0250	0	0				0	20	
Lead	<0.00150	0.00500	0	0				0	20	
Lithium	0.224	0.0500	0	0.219				2.48	20	
Molybdenum	0.0972	0.0250	0	0.0963				0.849	20	
Selenium	1.20	0.0250	0	1.22				1.75	20	
Thallium	<0.00250	0.00750	0	0.000793				0	20	

Sample ID: **2110266-01C PDS**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **PDS**	Run ID: **ICP-MS5_211102A**	Analysis Date: **11/2/2021 11:25:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.209	0.00250	0.200	0.00332	103	75	125			
Arsenic	0.194	0.00500	0.200	0.00352	95.3	75	125			
Barium	0.288	0.0100	0.200	0.0878	100	75	125			
Beryllium	0.181	0.00100	0.200	0	90.5	75	125			
Cadmium	0.194	0.00100	0.200	0	97.1	75	125			
Chromium	0.200	0.00500	0.200	0	99.9	75	125			
Cobalt	0.191	0.00500	0.200	0	95.3	75	125			
Lead	0.199	0.00100	0.200	0	99.5	75	125			
Lithium	0.380	0.0100	0.200	0.219	80.8	75	125			
Molybdenum	0.299	0.00500	0.200	0.0963	101	75	125			
Selenium	1.36	0.00500	0.200	1.22	70.0	75	125			S
Thallium	0.201	0.00150	0.200	0.000793	99.9	75	125			

Sample ID: **2110266-01C MS**	Batch ID: **102658**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **MS**	Run ID: **ICP-MS5_211102A**	Analysis Date: **11/2/2021 11:29:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.210	0.00250	0.200	0.00332	103	75	125			
Dissolved Arsenic	0.200	0.00500	0.200	0.00352	98.2	75	125			
Dissolved Barium	0.294	0.0100	0.200	0.0878	103	75	125			
Dissolved Beryllium	0.186	0.00100	0.200	0	92.9	75	125			
Dissolved Cadmium	0.195	0.00100	0.200	0	97.5	75	125			
Dissolved Calcium	570	0.300	5.00	567	74.6	75	125			
Dissolved Chromium	0.198	0.00500	0.200	0	99.0	75	125			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211102A

Sample ID: **2110266-01C MS** Batch ID: **102658** TestNo: **SW6020B** Units: **mg/L**
SampType: **MS** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:29:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Cobalt	0.193	0.00500	0.200	0	96.5	75	125			
Dissolved Lead	0.200	0.00100	0.200	0	100	75	125			
Dissolved Lithium	0.404	0.0100	0.200	0.219	92.5	75	125			
Dissolved Magnesium	931	0.300	5.00	914	343	75	125			S
Dissolved Molybdenum	0.314	0.00500	0.200	0.0963	109	75	125			
Dissolved Potassium	76.5	0.300	5.00	71.0	110	75	125			
Dissolved Selenium	1.46	0.00500	0.200	1.22	121	75	125			
Dissolved Sodium	567	0.300	5.00	549	349	75	125			S
Dissolved Thallium	0.204	0.00150	0.200	0.000793	102	75	125			

Sample ID: **2110266-01C MSD** Batch ID: **102658** TestNo: **SW6020B** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:31:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.211	0.00250	0.200	0.00332	104	75	125	0.497	15	
Dissolved Arsenic	0.201	0.00500	0.200	0.00352	98.8	75	125	0.571	15	
Dissolved Barium	0.295	0.0100	0.200	0.0878	104	75	125	0.346	15	
Dissolved Beryllium	0.184	0.00100	0.200	0	91.8	75	125	1.20	15	
Dissolved Cadmium	0.196	0.00100	0.200	0	97.9	75	125	0.459	15	
Dissolved Calcium	575	0.300	5.00	567	177	75	125	0.891	15	S
Dissolved Chromium	0.201	0.00500	0.200	0	100	75	125	1.23	15	
Dissolved Cobalt	0.195	0.00500	0.200	0	97.6	75	125	1.16	15	
Dissolved Lead	0.201	0.00100	0.200	0	100	75	125	0.113	15	
Dissolved Lithium	0.401	0.0100	0.200	0.219	91.2	75	125	0.647	15	
Dissolved Magnesium	944	0.300	5.00	914	603	75	125	1.39	15	S
Dissolved Molybdenum	0.316	0.00500	0.200	0.0963	110	75	125	0.759	15	
Dissolved Potassium	76.9	0.300	5.00	71.0	117	75	125	0.425	15	
Dissolved Selenium	1.47	0.00500	0.200	1.22	126	75	125	0.700	15	S
Dissolved Sodium	572	0.300	5.00	549	456	75	125	0.937	15	S
Dissolved Thallium	0.205	0.00150	0.200	0.000793	102	75	125	0.540	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211102A

Sample ID: **ICV-211102**	Batch ID: **R117824**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **ICV**	Run ID: **ICP-MS5_211102A**	Analysis Date: **11/2/2021 10:54:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.102	0.00250	0.100	0	102	90	110			
Dissolved Arsenic	0.101	0.00500	0.100	0	101	90	110			
Dissolved Barium	0.102	0.0100	0.100	0	102	90	110			
Dissolved Beryllium	0.0952	0.00100	0.100	0	95.2	90	110			
Dissolved Cadmium	0.101	0.00100	0.100	0	101	90	110			
Dissolved Calcium	2.50	0.300	2.50	0	99.9	90	110			
Dissolved Chromium	0.104	0.00500	0.100	0	104	90	110			
Dissolved Cobalt	0.104	0.00500	0.100	0	104	90	110			
Dissolved Lead	0.101	0.00100	0.100	0	101	90	110			
Dissolved Lithium	0.0939	0.0100	0.100	0	93.9	90	110			
Dissolved Magnesium	2.43	0.300	2.50	0	97.2	90	110			
Dissolved Molybdenum	0.0980	0.00500	0.100	0	98.0	90	110			
Dissolved Potassium	2.53	0.300	2.50	0	101	90	110			
Dissolved Selenium	0.103	0.00500	0.100	0	103	90	110			
Dissolved Sodium	2.52	0.300	2.50	0	101	90	110			
Dissolved Thallium	0.0998	0.00150	0.100	0	99.8	90	110			

Sample ID: **LCVL-211102**	Batch ID: **R117824**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_211102A**	Analysis Date: **11/2/2021 10:59:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.00203	0.00250	0.00200	0	102	80	120			
Dissolved Arsenic	0.00499	0.00500	0.00500	0	99.8	80	120			
Dissolved Barium	0.00495	0.0100	0.00500	0	98.9	80	120			
Dissolved Beryllium	0.00102	0.00100	0.00100	0	102	80	120			
Dissolved Cadmium	0.00107	0.00100	0.00100	0	107	80	120			
Dissolved Calcium	0.0971	0.300	0.100	0	97.1	80	120			
Dissolved Chromium	0.00514	0.00500	0.00500	0	103	80	120			
Dissolved Cobalt	0.00512	0.00500	0.00500	0	102	80	120			
Dissolved Lead	0.00103	0.00100	0.00100	0	103	80	120			
Dissolved Lithium	0.00974	0.0100	0.0100	0	97.4	80	120			
Dissolved Magnesium	0.0998	0.300	0.100	0	99.8	80	120			
Dissolved Molybdenum	0.00507	0.00500	0.00500	0	101	80	120			
Dissolved Potassium	0.102	0.300	0.100	0	102	80	120			
Dissolved Selenium	0.00488	0.00500	0.00500	0	97.7	80	120			
Dissolved Sodium	0.107	0.300	0.100	0	107	80	120			
Dissolved Thallium	0.00105	0.00150	0.00100	0	105	80	120			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211102A

Sample ID: **CCV1-211102** Batch ID: **R117824** TestNo: **SW6020B** Units: **mg/L**
SampType: **CCV** Run ID: **ICP-MS5_211102A** Analysis Date: **11/2/2021 11:40:00 AM** Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dissolved Antimony	0.201	0.00250	0.200	0	101	90	110			
Dissolved Arsenic	0.202	0.00500	0.200	0	101	90	110			
Dissolved Barium	0.199	0.0100	0.200	0	99.6	90	110			
Dissolved Beryllium	0.197	0.00100	0.200	0	98.4	90	110			
Dissolved Cadmium	0.201	0.00100	0.200	0	101	90	110			
Dissolved Calcium	5.15	0.300	5.00	0	103	90	110			
Dissolved Chromium	0.200	0.00500	0.200	0	100	90	110			
Dissolved Cobalt	0.204	0.00500	0.200	0	102	90	110			
Dissolved Lead	0.199	0.00100	0.200	0	99.5	90	110			
Dissolved Lithium	0.198	0.0100	0.200	0	98.8	90	110			
Dissolved Magnesium	5.30	0.300	5.00	0	106	90	110			
Dissolved Molybdenum	0.202	0.00500	0.200	0	101	90	110			
Dissolved Potassium	5.30	0.300	5.00	0	106	90	110			
Dissolved Selenium	0.199	0.00500	0.200	0	99.6	90	110			
Dissolved Sodium	5.35	0.300	5.00	0	107	90	110			
Dissolved Thallium	0.200	0.00150	0.200	0	100	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_210928A

Sample ID: **DCS2-102216**	Batch ID: **102216**	TestNo: **E300**	Units: **mg/L**
SampType: **DCS2**	Run ID: **IC2_210928A**	Analysis Date: **9/28/2021 1:38:01 PM**	Prep Date: **9/28/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	0.533	1.00	0.5000	0	107	70	130	0	0	
Fluoride	0.179	0.400	0.2000	0	89.5	70	130	0	0	
Sulfate	1.55	3.00	1.500	0	104	70	130	0	0	

Sample ID: **DCS3-102216**	Batch ID: **102216**	TestNo: **E300**	Units: **mg/L**
SampType: **DCS3**	Run ID: **IC2_210928A**	Analysis Date: **9/28/2021 1:54:01 PM**	Prep Date: **9/28/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	1.05	1.00	1.000	0	105	70	130	0	0	
Fluoride	0.324	0.400	0.4000	0	81.0	70	130	0	0	
Sulfate	3.10	3.00	3.000	0	103	70	130	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_211101A

The QC data in batch 102648 applies to the following samples: 2110266-01B

Sample ID: **MB-102648** Batch ID: **102648** TestNo: **E300** Units: **mg/L**
SampType: **MBLK** Run ID: **IC2_211101A** Analysis Date: **11/1/2021 1:30:12 PM** Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	<0.300	1.00								
Fluoride	<0.100	0.400								
Sulfate	<1.00	3.00								

Sample ID: **LCS-102648** Batch ID: **102648** TestNo: **E300** Units: **mg/L**
SampType: **LCS** Run ID: **IC2_211101A** Analysis Date: **11/1/2021 1:46:12 PM** Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.1	1.00	10.00	0	101	90	110			
Fluoride	4.03	0.400	4.000	0	101	90	110			
Sulfate	31.6	3.00	30.00	0	105	90	110			

Sample ID: **LCSD-102648** Batch ID: **102648** TestNo: **E300** Units: **mg/L**
SampType: **LCSD** Run ID: **IC2_211101A** Analysis Date: **11/1/2021 2:02:11 PM** Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.1	1.00	10.00	0	101	90	110	0.018	20	
Fluoride	4.06	0.400	4.000	0	101	90	110	0.610	20	
Sulfate	31.4	3.00	30.00	0	105	90	110	0.399	20	

Sample ID: **2110242-10EMS** Batch ID: **102648** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_211101A** Analysis Date: **11/1/2021 7:27:12 PM** Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	247	10.0	200.0	47.89	99.6	90	110			
Fluoride	206	4.00	200.0	0	103	90	110			
Sulfate	246	30.0	200.0	47.66	99.1	90	110			

Sample ID: **2110242-10EMSD** Batch ID: **102648** TestNo: **E300** Units: **mg/L**
SampType: **MSD** Run ID: **IC2_211101A** Analysis Date: **11/1/2021 7:43:12 PM** Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	248	10.0	200.0	47.89	99.9	90	110	0.207	20	
Fluoride	206	4.00	200.0	0	103	90	110	0.275	20	
Sulfate	246	30.0	200.0	47.66	99.3	90	110	0.136	20	

Sample ID: **2110266-01BMS** Batch ID: **102648** TestNo: **E300** Units: **mg/L**
SampType: **MS** Run ID: **IC2_211101A** Analysis Date: **11/2/2021 11:02:23 AM** Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_211101A

Sample ID: **2110266-01BMS**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **MS**	Run ID: **IC2_211101A**	Analysis Date: **11/2/2021 11:02:23 AM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	2430	100	2000	607.2	91.0	90	110			
Fluoride	2010	40.0	2000	0	101	90	110			
Sulfate	4400	300	2000	2661	87.0	90	110			S

Sample ID: **2110266-01BMSD**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **MSD**	Run ID: **IC2_211101A**	Analysis Date: **11/2/2021 11:18:23 AM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	2420	100	2000	607.2	90.4	90	110	0.525	20	
Fluoride	2010	40.0	2000	0	101	90	110	0.040	20	
Sulfate	4390	300	2000	2661	86.2	90	110	0.349	20	S

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_211101A

Sample ID: **ICV-211101**	Batch ID: **R117803**	TestNo: **E300**	Units: **mg/L**
SampType: **ICV**	Run ID: **IC2_211101A**	Analysis Date: **11/1/2021 12:58:12 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	25.4	1.00	25.00	0	102	90	110			
Fluoride	10.4	0.400	10.00	0	104	90	110			
Sulfate	80.2	3.00	75.00	0	107	90	110			

Sample ID: **CCV1-211101**	Batch ID: **R117803**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_211101A**	Analysis Date: **11/1/2021 9:51:12 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.2	1.00	10.00	0	102	90	110			
Fluoride	4.03	0.400	4.000	0	101	90	110			
Sulfate	32.0	3.00	30.00	0	107	90	110			

Sample ID: **CCV2-211101**	Batch ID: **R117803**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_211101A**	Analysis Date: **11/1/2021 11:59:12 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.4	1.00	10.00	0	104	90	110			
Fluoride	4.16	0.400	4.000	0	104	90	110			
Sulfate	31.6	3.00	30.00	0	105	90	110			

Sample ID: **CCV3-211101**	Batch ID: **R117803**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_211101A**	Analysis Date: **11/2/2021 11:50:23 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.2	1.00	10.00	0	102	90	110			
Fluoride	3.94	0.400	4.000	0	98.5	90	110			
Sulfate	31.8	3.00	30.00	0	106	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_211101B

The QC data in batch 102648 applies to the following samples: 2110266-01B

Sample ID: **MB-102648**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **MBLK**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 1:30:12 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	<0.300	1.00								

Sample ID: **LCS-102648**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **LCS**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 1:46:12 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.1	1.00	10.00	0	101	80	120			

Sample ID: **LCSD-102648**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **LCSD**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 2:02:11 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.1	1.00	10.00	0	101	80	120	0.018	20	

Sample ID: **DCS2-102648**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **DCS2**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 5:03:12 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	0.624	1.00	0.5000	0	125	70	130			
Sulfate	1.70	3.00	1.500	0	113	70	130			

Sample ID: **DCS3-102648**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **DCS3**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 5:19:12 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.304	0.400	0.4000	0	76.0	70	130			
Sulfate	3.24	3.00	3.000	0	108	70	130			

Sample ID: **2110242-10EMS**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **MS**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 7:27:12 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	247	10.0	200.0	47.89	99.6	80	120			

Sample ID: **2110242-10EMSD**	Batch ID: **102648**	TestNo: **E300**	Units: **mg/L**
SampType: **MSD**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 7:43:12 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	248	10.0	200.0	47.89	99.9	80	120	0.207	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_211101B

Sample ID: **2110266-01BMS**	Batch ID: **102648**	TestNo: **E300**				Units:	**mg/L**
SampType: **MS**	Run ID: **IC2_211101B**	Analysis Date: **11/2/2021 11:02:23 AM**				Prep Date:	**11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	2430	100	2000	607.2	91.0	80	120			

Sample ID: **2110266-01BMSD**	Batch ID: **102648**	TestNo: **E300**				Units:	**mg/L**
SampType: **MSD**	Run ID: **IC2_211101B**	Analysis Date: **11/2/2021 11:18:23 AM**				Prep Date:	**11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	2420	100	2000	607.2	90.4	80	120	0.525	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_211101B

Sample ID: **ICV-211101**	Batch ID: **R117838**	TestNo: **E300**	Units: **mg/L**
SampType: **ICV**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 12:58:12 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	25.4	1.00	25.00	0	102	90	110			

Sample ID: **CCV1-211101**	Batch ID: **R117838**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 9:51:12 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.2	1.00	10.00	0	102	90	110			

Sample ID: **CCV2-211101**	Batch ID: **R117838**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_211101B**	Analysis Date: **11/1/2021 11:59:12 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.4	1.00	10.00	0	104	90	110			

Sample ID: **CCV3-211101**	Batch ID: **R117838**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_211101B**	Analysis Date: **11/2/2021 11:50:23 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.2	1.00	10.00	0	102	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_211102A

The QC data in batch 102665 applies to the following samples: 2110266-01B

Sample ID: **2110266-01B-DUP** Batch ID: **102665** TestNo: **M4500-H+ B** Units: **pH Units@17.3°C**
SampType: **DUP** Run ID: **TITRATOR_211102A** Analysis Date: **11/2/2021 9:54:00 AM** Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	8.33	0	0	8.310				0.240	5	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_211102A

Sample ID: **ICV-211102**	Batch ID: **R117815**	TestNo: **M4500-H+ B**	Units: **pH Units@22.3°C**
SampType: **ICV**	Run ID: **TITRATOR_211102A**	Analysis Date: **11/2/2021 9:18:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	10.04	0	10.00	0	100	99	101			

Sample ID: **CCV1-211102**	Batch ID: **R117815**	TestNo: **M4500-H+ B**	Units: **pH Units@21.8°C**
SampType: **CCV**	Run ID: **TITRATOR_211102A**	Analysis Date: **11/2/2021 9:57:00 AM**	Prep Date: **11/2/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	7.01	0	7.000	0	100	97.1	102.9			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_211103A

The QC data in batch 102689 applies to the following samples: 2110266-01B

Sample ID: **MB-102689** Batch ID: **102689** TestNo: **M2320 B** Units: **mg/L @ pH 4.41**
SampType: **MBLK** Run ID: **TITRATOR_211103A** Analysis Date: **11/3/2021 11:45:00 AM** Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	<10.0	20.0								
Alkalinity, Carbonate (As CaCO3)	<10.0	20.0								
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0								
Alkalinity, Total (As CaCO3)	<20.0	20.0								

Sample ID: **LCS-102689** Batch ID: **102689** TestNo: **M2320 B** Units: **mg/L @ pH 4.21**
SampType: **LCS** Run ID: **TITRATOR_211103A** Analysis Date: **11/3/2021 11:49:00 AM** Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	54.6	20.0	50.00	0	109	74	129			

Sample ID: **2110256-07B-DUP** Batch ID: **102689** TestNo: **M2320 B** Units: **mg/L @ pH 4.5**
SampType: **DUP** Run ID: **TITRATOR_211103A** Analysis Date: **11/3/2021 12:53:00 PM** Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	43.5	20.0	0	44.50				2.27	20	
Alkalinity, Carbonate (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Total (As CaCO3)	43.5	20.0	0	44.50				2.27	20	

Sample ID: **2110256-08B-DUP** Batch ID: **102689** TestNo: **M2320 B** Units: **mg/L @ pH 4.49**
SampType: **DUP** Run ID: **TITRATOR_211103A** Analysis Date: **11/3/2021 1:04:00 PM** Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	61.6	20.0	0	62.90				2.09	20	
Alkalinity, Carbonate (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Total (As CaCO3)	61.6	20.0	0	62.90				2.09	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_211103A

Sample ID: **ICV-211103**	Batch ID: **R117871**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.27**
SampType: **ICV**	Run ID: **TITRATOR_211103A**	Analysis Date: **11/3/2021 11:41:00 AM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	8.48	20.0	0							
Alkalinity, Carbonate (As CaCO3)	93.1	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	102	20.0	100.0	0	102	98	102			

Sample ID: **CCV1-211103**	Batch ID: **R117871**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.28**
SampType: **CCV**	Run ID: **TITRATOR_211103A**	Analysis Date: **11/3/2021 1:45:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	23.7	20.0	0							
Alkalinity, Carbonate (As CaCO3)	77.8	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	101	20.0	100.0	0	101	90	110			

Sample ID: **CCV2-211103**	Batch ID: **R117871**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.37**
SampType: **CCV**	Run ID: **TITRATOR_211103A**	Analysis Date: **11/3/2021 2:27:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	27.2	20.0	0							
Alkalinity, Carbonate (As CaCO3)	74.4	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	102	20.0	100.0	0	102	90	110			

Sample ID: **CCV3-211103**	Batch ID: **R117871**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.27**
SampType: **CCV**	Run ID: **TITRATOR_211103A**	Analysis Date: **11/3/2021 3:16:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	11.6	20.0	0							
Alkalinity, Carbonate (As CaCO3)	90.7	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	102	20.0	100.0	0	102	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

ANALYTICAL QC SUMMARY REPORT

RunID: WC_211101B

The QC data in batch 102647 applies to the following samples: 2110266-01B

Sample ID: **MB-102647**	Batch ID: **102647**	TestNo: **M2540C**	Units: **mg/L**
SampType: **MBLK**	Run ID: **WC_211101B**	Analysis Date: **11/1/2021 1:30:00 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	<10.0	10.0								

Sample ID: **LCS-102647**	Batch ID: **102647**	TestNo: **M2540C**	Units: **mg/L**
SampType: **LCS**	Run ID: **WC_211101B**	Analysis Date: **11/1/2021 1:30:00 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	746	10.0	745.6	0	100	90	113			

Sample ID: **2110244-02D-DUP**	Batch ID: **102647**	TestNo: **M2540C**	Units: **mg/L**
SampType: **DUP**	Run ID: **WC_211101B**	Analysis Date: **11/1/2021 1:30:00 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	4870	50.0	0	4850				0.412	5	

Sample ID: **2110244-03D-DUP**	Batch ID: **102647**	TestNo: **M2540C**	Units: **mg/L**
SampType: **DUP**	Run ID: **WC_211101B**	Analysis Date: **11/1/2021 1:30:00 PM**	Prep Date: **11/1/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	2020	50.0	0	2020				0	5	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2110266
Project: Martin Lake PDP5

MQL SUMMARY REPORT

TestNo: E300	**MDL**	**MQL**
Analyte	**mg/L**	**mg/L**
Chloride	0.300	1.00
Fluoride	0.100	0.400
Sulfate	1.00	3.00

TestNo: E300	**MDL**	**MQL**
Analyte	**mg/L**	**mg/L**
Chloride	0.300	1.00

TestNo: SW6020B	**MDL**	**MQL**
Analyte	**mg/L**	**mg/L**
Antimony	0.000800	0.00250
Arsenic	0.00200	0.00500
Barium	0.00300	0.0100
Beryllium	0.000300	0.00100
Boron	0.0100	0.0300
Cadmium	0.000300	0.00100
Calcium	0.100	0.300
Chromium	0.00200	0.00500
Cobalt	0.00300	0.00500
Lead	0.000300	0.00100
Lithium	0.00500	0.0100
Magnesium	0.100	0.300
Molybdenum	0.00200	0.00500
Potassium	0.100	0.300
Selenium	0.00200	0.00500
Sodium	0.100	0.300
Thallium	0.000500	0.00150

TestNo: M2320 B	**MDL**	**MQL**
Analyte	**ıg/L @ pH 4.4**	**g/L @ pH 4.4**
Alkalinity, Bicarbonate (As CaCO3)	10.0	20.0
Alkalinity, Carbonate (As CaCO3)	10.0	20.0
Alkalinity, Hydroxide (As CaCO3)	10.0	20.0
Alkalinity, Total (As CaCO3)	20.0	20.0

TestNo: SW7470A	**MDL**	**MQL**
Analyte	**mg/L**	**mg/L**
Mercury	0.0000800	0.000200

TestNo: M2540C	**MDL**	**MQL**
Analyte	**mg/L**	**mg/L**
Total Dissolved Solids (Residue, Filt	10.0	10.0

Qualifiers: MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

APPENDIX E

PDP-5 CCL – Total Iron and Aluminum and CEC Laboratory Analytical Reports

November 22, 2021

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 2111001

RE: Martin Lake PDP-5

Dear Will Vienne:

DHL Analytical, Inc. received 1 sample(s) on 10/30/2021 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-21-27

Table of Contents

DHL ANALYTICAL
2300 Double Creek Dr. Round Rock, TX 78664
Phone 512.388.8222
Web: **www.dhlanalytical.com**
Email: **login@dhlanalytical.com**

CHAIN-OF-CUSTODY

CLIENT: Golder
ADDRESS: 2201 Double Creek Dr, Suite 4004
PHONE: (512) 466-9074 EMAIL: Patrick_Behling@golder.com
DATA REPORTED TO: Pat Behling and Will Vienne
ADDITIONAL REPORT COPIES TO:

DATE: 10/29/2021
PO#: 20142271
PROJECT LOCATION OR NAME: Martin Lake PDP-5
CLIENT PROJECT # 20142271 COLLECTOR: ARNOLDO HERRERA

LABORATORY USE ONLY
DHL WORKORDER #: 2111001

Authorize 5% surcharge for TRRP report? ☐ Yes ☒ No

Lab Use Only: W=WATER L=LIQUID S=SOIL SO=SOLID SE=SEDIMENT P=PAINT SL=SLUDGE

Field Sample I.D.	DHL Lab #	Collection Date	Collection Time	Matrix	Container Type	# of Containers	PRESERVATION: HCL	HNO_3	H_2SO_4	NaOH ☐ Zn Acetate ☐	ICE ☐ UNPRESERVED ☒	ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8260]	TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐	GRO 8015 ☐ DRO 8015 ☐	VOC 8260 ☐ VOC 624.1 ☐	SVOC 8270 ☐ SVOC 625.1 ☐	PAH 8270 ☐ HOLD PAH ☐	PEST 8270 ☐ 625.1 ☐ O-P PEST 8270 ☐	PCB 8082 ☐ 608.3 ☐ PCB 8270 ☐ 625.1 ☐	HERB 8321 ☐ T PHOS ☐ AMMONIA ☐	METALS 6020☒ 200.8 ☐ DISS. METALS ☐	RCRA 8 ☐ TX11 ☐	pH☐ HEX CHROM☐ ALKALINITY☐ COD☐	ANIONS 300 ☐ 9056 ☐	TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐	TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐	RCI ☐ IGN ☐ DGAS ☐ OIL&GREASE ☐	TDS ☐ TSS ☐ % MOIST ☐ CYANIDE ☐	CEC			FIELD NOTES
L.T. PERM	01	9/17/21		S							X										X								X			Total Fe and Al only
		Per Will V. @ 11:21																														Add CEC per W Vienne 11/3/21 GD

Relinquished By: (Sign)	DATE/TIME	Received by:
	10/29/2021 @1020	FEDEX
FEDEX	10/30/21 2:15PM	
Relinquished By: (Sign)	DATE/TIME	Received by:

TURN AROUND TIME (CALL FIRST FOR RUSH)
RUSH-1 DAY☐ RUSH-2 DAY☐
RUSH-3 DAY☒
NORMAL ☐ OTHER ☐
DUE DATE _____ ☐

LABORATORY USE ONLY
RECEIVING TEMP (°C): 22.3 THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LSO ☒ FEDEX ☐ UPS ☐ COURIER ☐ OTHER ☐ HAND DELIVERED

☐ **DHL DISPOSAL @ 5.00 each** ☐ **Return**

DHL COC REV 3 | MAR 2021

ORIGIN ID:MIFA (281) 821-6868
HOUSTON LAB
GOLDER ASSOCIATES
1404 N. SAM HOUSTON PARKWAY E.
SUITE 130
HOUSTON, TX 77032
UNITED STATES US

SHIP DATE: 29OCT21
ACTWGT: 1.80 LB
CAD: 107324200/INET4400

BILL SENDER

TO

DHL ANALYTICAL
2300 DOUBLE CREEK DR.

ROUND ROCK TX 78664
(512) 388-8222 REF: 20142271
INV:
PO: DEPT:

56DJ3/14BA/FE4A

FedEx Express

J212221101801uv

SATURDAY 9:30A
FIRST OVERNIGHT

TRK# 0201 **7750 6708 9860**

X0 BSMA

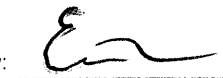
78664
TX-US **AUS**

DHL Analytical, Inc.

Sample Receipt Checklist

Client Name **Golder** Date Received: **10/30/2021**

Work Order Number **2111001** Received by: **AH**

Checklist completed by:  11/1/2021 Reviewed by SH 11/1/2021

Signature | Date | Initials | Date

Carrier name: FedEx 1day

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	**22.3** °C
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH<2 acceptable upon receipt?	Yes ☐	No ☐	NA ☑ LOT #
	Adjusted?		Checked by
Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt?	Yes ☐	No ☐	NA ☑ LOT #
	Adjusted?		Checked by

Any No response must be detailed in the comments section below.

Client contacted: Date contacted: Person contacted

Contacted by: Regarding:

Comments:

Corrective Action:

Page 1 of 1

Laboratory Name: DHL Analytical, Inc.

Laboratory Review Checklist: Reportable Data

Project Name: Martin Lake PDP-5	**LRC Date:** 11/22/21
Reviewer Name: Carlos Castro	**Laboratory Work Order:** 2111001
Prep Batch Number(s): See Prep Dates Report	**Run Batch:** See Analytical Dates Report

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
		Chain-of-Custody (C-O-C)					
R1	OI	**1)** Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	**X**				**R1-01**
		2) Were all departures from standard conditions described in an exception report?			**X**		
R2	OI	**Sample and Quality Control (QC) Identification**					
		1) Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	**X**				
		2) Are all laboratory ID numbers cross-referenced to the corresponding QC data?	**X**				
R3	OI	**Test Reports**					
		1) Were all samples prepared and analyzed within holding times?	**X**				
		2) Other than those results < MQL, were all other raw values bracketed by calibration standards?	**X**				
		3) Were calculations checked by a peer or supervisor?	**X**				
		4) Were all analyte identifications checked by a peer or supervisor?	**X**				
		5) Were sample detection limits reported for all analytes not detected?	**X**				
		6) Were all results for soil and sediment samples reported on a dry weight basis?	**X**				
		7) Were % moisture (or solids) reported for all soil and sediment samples?	**X**				
		8) Were bulk soils/solids samples for volatile analysis extracted with methanol per EPA Method 5035?			**X**		
		9) If required for the project, TICs reported?			**X**		
R4	O	**Surrogate Recovery Data**					
		1) Were surrogates added prior to extraction?			**X**		
		2) Were surrogate percent recoveries in all samples within the laboratory QC limits?			**X**		
R5	OI	**Test Reports/Summary Forms for Blank Samples**					
		1) Were appropriate type(s) of blanks analyzed?	**X**				
		2) Were blanks analyzed at the appropriate frequency?	**X**				
		3) Where method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	**X**				
		4) Were blank concentrations < MDL?	**X**				
		5) For analyte(s) detected in a blank sample, was the concentration, unadjusted for sample specific factors, in all associated field samples, **greater** than 10 times the concentration in the blank sample?			**X**		
R6	OI	**Laboratory Control Samples (LCS):**					
		1) Were all COCs included in the LCS?	**X**				
		2) Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	**X**				
		3) Were LCSs analyzed at the required frequency?	**X**				
		4) Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	**X**				
		5) Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	**X**				
		6) Was the LCSD RPD within QC limits (if applicable)?	**X**				
R7	OI	**Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Data**					
		1) Were the project/method specified analytes included in the MS and MSD?	**X**				
		2) Were MS/MSD analyzed at the appropriate frequency?	**X**				
		3) Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		**X**			**R7-03**
		4) Were MS/MSD RPDs within laboratory QC limits?	**X**				
R8	OI	**Analytical Duplicate Data**					
		1) Were appropriate analytical duplicates analyzed for each matrix?	**X**				
		2) Were analytical duplicates analyzed at the appropriate frequency?	**X**				
		3) Were RPDs or relative standard deviations within the laboratory QC limits?	**X**				
R9	OI	**Method Quantitation Limits (MQLs):**					
		1) Are the MQLs for each method analyte included in the laboratory data package?	**X**				
		2) Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	**X**				
		3) Are unadjusted MQLs and DCSs included in the laboratory data package?	**X**				
R10	OI	**Other Problems/Anomalies**					
		1) Are all known problems/anomalies/special conditions noted in this LRC and ER?	**X**				
		2) Was applicable and available technology used to lower the SDL to minimize the matrix interference affects on the sample results?	**X**				
		3) Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	**X**				

Laboratory Name: DHL Analytical, Inc.

Laboratory Review Checklist (continued): Supporting Data

Project Name: Martin Lake PDP-5	**LRC Date:** 11/22/21
Reviewer Name: Carlos Castro	**Laboratory Work Order:** 2111001
Prep Batch Number(s): See Prep Dates Report	**Run Batch:** See Analytical Dates Report

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial Calibration (ICAL)**					
		1) Were response factors and/or relative response factors for each analyte within QC limits?	X				
		2) Were percent RSDs or correlation coefficient criteria met?	X				
		3) Was the number of standards recommended in the method used for all analytes?	X				
		4) Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		5) Are ICAL data available for all instruments used?	X				
		6) Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and Continuing calibration Verification (ICCV and CCV) and Continuing Calibration blank (CCB):**					
		1) Was the CCV analyzed at the method-required frequency?	X				
		2) Were percent differences for each analyte within the method-required QC limits?	X				
		3) Was the ICAL curve verified for each analyte?	X				
		4) Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3	O	**Mass Spectral Tuning:**					
		1) Was the appropriate compound for the method used for tuning?	X				
		2) Were ion abundance data within the method-required QC limits?	X				
S4	O	**Internal Standards (IS):**					
		1) Were IS area counts and retention times within the method-required QC limits?	X				
S5	OI	**Raw Data (NELAC Section 5.5.10)**					
		1) Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		2) Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual Column Confirmation**					
		1) Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively Identified Compounds (TICs):**					
		1) If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) Results:**					
		1) Were percent recoveries within method QC limits?	X				
S9	I	**Serial Dilutions, Post Digestion Spikes, and Method of Standard Additions**					
		1) Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10	OI	**Method Detection Limit (MDL) Studies**					
		1) Was a MDL study performed for each reported analyte?	X				
		2) Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency Test Reports:**					
		1) Was the lab's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards Documentation**					
		1) Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/Analyte Identification Procedures**					
		1) Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of Analyst Competency (DOC)**					
		1) Was DOC conducted consistent with NELAC Chapter 5 – Appendix C?	X				
		2) Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/Validation Documentation for Methods** (NELAC Chapter 5)					
		1) Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory Standard Operating Procedures (SOPs):**					
		1) Are laboratory SOPs current and on file for each method performed?	X				

1 Items identified by the letter "R" should be included in the laboratory data package submitted to the TCEQ in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2 O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).
3 NA = Not applicable.
4 NR = Not Reviewed.
5 ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Data Package Signature Page – RG-366/TRRP-13

This data package consists of:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;
R2 Sample identification cross-reference;
R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).
R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.
R5 Test reports/summary forms for blank samples;
R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.
R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits
R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) The amount of analyte measured in the duplicate,
  b) The calculated RPD, and
  c) The laboratory's QC limits for analytical duplicates.
R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
R10 Other problems or anomalies.

The Exception Report for each "No" or "Not Reviewed (NR)" item in the Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory is not accredited under the Texas Laboratory Accreditation Program.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge that all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information or data affecting the quality of the data has been knowingly withheld.

This laboratory was last inspected by TCEQ on February 23-26 2021. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name: John DuPont
Official Title: General Manager

Signature

11/22/21

Date

Name: Dr. Derhsing Luu
Official Title: Technical Director

DHL Analytical, Inc. **Date:** *22-Nov-21*

CLIENT: Golder
Project: Martin Lake PDP-5
Lab Order: 2111001

CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020B - Metals Analysis
Method D2216 - Percent Moisture Analysis
Sub-contract - Cation Exchange Capacity analysis by method LA29B. Analyzed at ALS.

Exception Report R1-01

The sample was received and log-in performed on 10/30/21. A total of 1 sample was received. On 11/3/21 CEC was added to the sample as per the client. This was performed at the sub-contract laboratory. The sample arrived in good condition and was properly packaged.

Exception Report R7-03

For Metals analysis performed on 11/4/21 the matrix spike and matrix spike duplicate recoveries were out of control limits for Aluminum and Iron. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

DHL Analytical, Inc.

Date: *22-Nov-21*

CLIENT: Golder
Project: Martin Lake PDP-5
Lab Order: 2111001

Work Order Sample Summary

Lab Smp ID	Client Sample ID	Tag Number	Date Collected	Date Recved
2111001-01	L.T. PERM		09/17/21	10/30/2021

Lab Order: 2111001
Client: Golder
Project: Martin Lake PDP-5

PREP DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Number	Test Name	Prep Date	Batch ID
2111001-01A	L.T. PERM	09/17/21	Soil	D2216	Moisture Preparation	11/03/21 04:56 PM	102700
	L.T. PERM	09/17/21	Soil	SW3050B	Soil Prep Total Metals: ICP-MS	11/03/21 09:21 AM	102684
	L.T. PERM	09/17/21	Soil	SW3050B	Soil Prep Total Metals: ICP-MS	11/03/21 09:21 AM	102684

Lab Order: 2111001
Client: Golder
Project: Martin Lake PDP-5

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
2111001-01A	L.T. PERM	Soil	D2216	Percent Moisture	102700	1	11/04/21 08:46 AM	PMOIST_211103A
	L.T. PERM	Soil	SW6020B	Trace Metals: ICP-MS - Solid	102684	50	11/04/21 12:33 PM	ICP-MS5_211104A
	L.T. PERM	Soil	SW6020B	Trace Metals: ICP-MS - Solid	102684	5	11/04/21 12:08 PM	ICP-MS5_211104A
2111001-01B	L.T. PERM	Soil	LA29B	Cation Exchange Capacity	R118126	1	11/19/21 12:50 PM	SUB_211119A

DHL Analytical, Inc.

Date: *22-Nov-21*

CLIENT:	Golder	**Client Sample ID:**	L.T. PERM
Project:	Martin Lake PDP-5	**Lab ID:**	2111001-01
Project No:	20142271	**Collection Date:**	09/17/21
Lab Order:	2111001	**Matrix:**	SOIL

Analyses	Result	SDL	RL	Qual	Units	DF	Date Analyzed
TRACE METALS: ICP-MS - SOLID		**SW6020B**					Analyst: **SP**
Aluminum	13200	113	339		mg/Kg-dry	50	11/04/21 12:33 PM
Iron	18500	113	339		mg/Kg-dry	50	11/04/21 12:33 PM
CATION EXCHANGE CAPACITY		**LA29B**					Analyst: **SUB**
Cation Exchange Capacity	14.9	0.0250	0.0250	N	mEquiv/100g	1	11/19/21 12:50 PM
PERCENT MOISTURE		**D2216**					Analyst: **MTK**
Percent Moisture	3.05	0	0		WT%	1	11/04/21 08:46 AM

Qualifiers:

- ND - Not Detected at the SDL
- J - Analyte detected between SDL and RL
- B - Analyte detected in the associated Method Blank
- DF- Dilution Factor
- N - Parameter not NELAP certified
- See Final Page of Report for MQLs and MDLs
- S - Spike Recovery outside control limits
- C - Sample Result or QC discussed in Case Narrative
- RL - Reporting Limit (MQL adjusted for moisture and sample size)
- SDL - Sample Detection Limit
- E - TPH pattern not Gas or Diesel Range Pattern

CLIENT: Golder
Work Order: 2111001
Project: Martin Lake PDP-5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211026A

Sample ID: **DCS1-102518** Batch ID: **102518** TestNo: **SW6020B** Units: **mg/Kg**
SampType: **DCS** Run ID: **ICP-MS5_211026A** Analysis Date: **10/26/2021 10:53:00 A** Prep Date: **10/25/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	38.3	37.5	37.50	0	102	70	130	0	0	
Iron	38.7	37.5	37.50	0	103	70	130	0	0	

Qualifiers:	B	Analyte detected in the associated Method Blank	DF	Dilution Factor	
	J	Analyte detected between MDL and RL	MDL	Method Detection Limit	
	ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits	
	RL	Reporting Limit	S	Spike Recovery outside control limits	
	J	Analyte detected between SDL and RL	N	Parameter not NELAP certified	

CLIENT: Golder
Work Order: 2111001
Project: Martin Lake PDP-5

ANALYTICAL QC SUMMARY REPORT

RunID: **ICP-MS5_211104A**

The QC data in batch 102684 applies to the following samples: 2111001-01A

Sample ID: **MB-102684**	Batch ID: **102684**	TestNo: **SW6020B**	Units: **mg/Kg**
SampType: **MBLK**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 11:58:00 AM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	<12.5	37.5								
Iron	<12.5	37.5								

Sample ID: **LCS-102684**	Batch ID: **102684**	TestNo: **SW6020B**	Units: **mg/Kg**
SampType: **LCS**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 12:00:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	249	37.5	250.0	0	99.8	80	120			
Iron	249	37.5	250.0	0	99.8	80	120			

Sample ID: **LCSD-102684**	Batch ID: **102684**	TestNo: **SW6020B**	Units: **mg/Kg**
SampType: **LCSD**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 12:03:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	246	37.5	250.0	0	98.2	80	120	1.57	25	
Iron	247	37.5	250.0	0	98.7	80	120	1.15	25	

Sample ID: **2111001-01A MS**	Batch ID: **102684**	TestNo: **SW6020B**	Units: **mg/Kg-dry**
SampType: **MS**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 12:25:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	15700	33.6	224.2	13210	1100	75	125			S
Iron	18100	33.6	224.2	17980	46.1	75	125			S

Sample ID: **2111001-01A MSD**	Batch ID: **102684**	TestNo: **SW6020B**	Units: **mg/Kg-dry**
SampType: **MSD**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 12:28:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	15300	33.9	226.2	13210	919	75	125	2.48	25	S
Iron	17400	33.9	226.2	17980	-271	75	125	4.05	25	S

Sample ID: **2111001-01A SD**	Batch ID: **102684**	TestNo: **SW6020B**	Units: **mg/Kg-dry**
SampType: **SD**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 12:35:00 PM**	Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	13100	1700	0	13230				1.33	20	
Iron	18600	1700	0	18530				0.129	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2111001
Project: Martin Lake PDP-5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211104A

Sample ID: **2111001-01A PDS** Batch ID: **102684** TestNo: **SW6020B** Units: **mg/Kg-dry**
SampType: **PDS** Run ID: **ICP-MS5_211104A** Analysis Date: **11/4/2021 12:38:00 PM** Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	24100	339	11310	13230	95.8	75	125			
Iron	29800	339	11310	18530	99.7	75	125			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2111001
Project: Martin Lake PDP-5

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_211104A

Sample ID: **ICV-211104**	Batch ID: **R117877**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **ICV**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 11:41:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	2.40	0.0300	2.50	0	95.8	90	110			
Iron	2.49	0.100	2.50	0	99.6	90	110			

Sample ID: **LCVL-211104**	Batch ID: **R117877**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 11:48:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.0938	0.0300	0.100	0	93.8	80	120			
Iron	0.0989	0.100	0.100	0	98.9	80	120			

Sample ID: **CCV1-211104**	Batch ID: **R117877**	TestNo: **SW6020B**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS5_211104A**	Analysis Date: **11/4/2021 12:41:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	4.86	0.0300	5.00	0	97.2	90	110			
Iron	5.08	0.100	5.00	0	102	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 2111001
Project: Martin Lake PDP-5

ANALYTICAL QC SUMMARY REPORT

RunID: PMOIST_211103A

The QC data in batch 102700 applies to the following samples: 2111001-01A

Sample ID: **2110239-11D-DUP** Batch ID: **102700** TestNo: **D2216** Units: **WT%**
SampType: **DUP** Run ID: **PMOIST_211103A** Analysis Date: **11/4/2021 8:46:00 AM** Prep Date: **11/3/2021**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Percent Moisture	14.9	0	0	14.80				0.539	30	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

DHL Analytical, Inc.

Date: *22-Nov-21*

CLIENT: Golder
Work Order: 2111001
Project: Martin Lake PDP-5

MQL SUMMARY REPORT

TestNo: SW6020B	MDL	MQL
Analyte	**mg/Kg**	**mg/Kg**
Aluminum	12.5	37.5
Iron	12.5	37.5

Qualifiers: MQL -Method Quantitation Limit as defined by TRRP
MDL -Method Detection Limit as defined by TRRP

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

November 19, 2021

John Dupont
DHL Analytical
2300 Double Creek Drive
Round Rock, TX 78664

Work Order: **HS21110378**

Laboratory Results for: **2111001**

Dear John Dupont,

ALS Environmental received 1 sample(s) on Nov 04, 2021 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER
Dane J. Wacasey

Client: DHL Analytical
Project: 2111001
Work Order: HS21110378

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS21110378-01	L.T. PERM	Soil		17-Sep-2021 00:00	04-Nov-2021 10:00	☐

Client: DHL Analytical
Project: 2111001
Work Order: HS21110378

CASE NARRATIVE

Metals by Method La29B CEC

Batch ID: R396071

• The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

Metals by Method La29B CEC Na

Batch ID: 172574

• The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

Client: DHL Analytical
Project: 2111001
Sample ID: L.T. PERM
Collection Date: 17-Sep-2021 00:00

ANALYTICAL REPORT
WorkOrder:HS21110378
Lab ID:HS21110378-01
Matrix:Soil

ANALYSES	RESULT	QUAL	MDL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
LA29B NA CATION EXCHANGE CAPACITY	**Method:La29B CEC**						Analyst: JHD
Na Cation Exchange Capacity	**14.9**	n	**0.0250**	**0.0250**	**meq/100-g**	1	19-Nov-2021 12:50
LA29B AMMONIUM ACETATE EXTRACTABLE NA FOR CEC	**Method:La29B CEC Na**				Prep:La29B CEC Na / 16-Nov-2021		Analyst: JHD
Sodium	**3,430**	n	**49.8**	**49.8**	**mg/Kg**	10	18-Nov-2021 17:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: DHL Analytical
Project: 2111001
WorkOrder: HS21110378

Batch ID: 172574 **Start Date:** 16 Nov 2021 13:09 **End Date:** 18 Nov 2021 09:00
Method: LADNR 29B NA CATION EXCHANGE CAPACITY **Prep Code:** LA29B CEC NAPR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor	
HS21110378-01		5.0181 (g)	100 (mL)	19.93	8-oz glass, Neat

Client: DHL Analytical
Project: 2111001
WorkOrder: HS21110378

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 172574 (0)	**Test Name :** LA29B AMMONIUM ACETATE EXTRACTABLE NA FOR CEC				**Matrix:** Soil	
HS21110378-01	L.T. PERM	17 Sep 2021 00:00		16 Nov 2021 13:09	18 Nov 2021 17:09	10
Batch ID: R396071 (0)	**Test Name :** LA29B NA CATION EXCHANGE CAPACITY				**Matrix:** Soil	
HS21110378-01	L.T. PERM	17 Sep 2021 00:00			19 Nov 2021 12:50	1

Client: DHL Analytical
Project: 2111001
WorkOrder: HS21110378

QC BATCH REPORT

Batch ID: 172574 (0) **Instrument:** ICPMS06 **Method:** LA29B AMMONIUM ACETATE EXTRACTABLE NA FOR CEC

MBLK Sample ID: **MBLK-172574** Units: **mg/Kg** Analysis Date: **18-Nov-2021 17:07**
Client ID: Run ID: **ICPMS06_395970** SeqNo: **6381137** PrepDate: **16-Nov-2021** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sodium	U	5.00								

DUP Sample ID: **HS21110615-05DUP** Units: **mg/Kg** Analysis Date: **18-Nov-2021 17:13**
Client ID: Run ID: **ICPMS06_395970** SeqNo: **6381140** PrepDate: **16-Nov-2021** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sodium	4734	49.9					4845	2.31	30	

The following samples were analyzed in this batch: HS21110378-01

Client: DHL Analytical
Project: 2111001
WorkOrder: **HS21110378**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	21-022-0	26-Mar-2022
Dept of Defense	PJLA L20-507-R2	22-Dec-2021
Florida	E87611-33	30-Jun-2022
Illinois	2000322021-7	09-May-2022
Kansas	E-10352 2021-2022	31-Jul-2022
Kentucky	123043, 2021-2022	30-Apr-2022
Louisiana	03087, 2021-2022	30-Jun-2022
North Carolina	624-2021	31-Dec-2021
Texas	T104704231-21-28	30-Apr-2022

Sample Receipt Checklist

Work Order ID: HS21110378 **Date/Time Received:** **04-Nov-2021 10:00**

Client Name: DHL **Received by:** **Nilesh D. Ranchod**

Completed By:	/S/ Jared R. Makan	06-Nov-2021 09:06	**Reviewed by:**	/S/ Dane J. Wacasey	11-Nov-2021 13:00
	eSignature	Date/Time		eSignature	Date/Time

Matrices: **Soil** Carrier name: **UPS**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:2111001
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☐	No ☑	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	
Temperature(s)/Thermometer(s):	14.7-°C UC/C	IR31	
Cooler(s)/Kit(s):	Box		
Date/Time sample(s) sent to storage:	11/06/2021 09:10		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑
pH adjusted by:			

Login Notes: Collection time not listed on COC & sample container, logged in with a collection time of 00:00am.

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

DHL Analytical, Inc.
2300 Double Creek Drive
Round Rock, TX 78664
TEL: *(512) 388-8222* FAX:

CHAIN-OF-CUSTODY RECORD

Work Order: 2111001

Subcontractor:

ALS Laboratory Group
P.O. Box 975444
Houston, Texas 77099

TEL: (281) 530-5656
FAX:
Acct #:

03-Nov-21

Sample ID	Matrix	DHL#	Date Collected	Bottle Type	Requested Tests: CEC	Requested Tests: LA29B
L.T. PERM	Soil	01B	09/17/21	8OZGLJAR	1	

HS21110378
DHL Analytical
2111001

General Comments:
Please analyze these samples with a Standard Turnaround Time.
Quality Control Package Needed: TRRP - SEND PDF & Excel EDD Please
EMAIL report to both cac@dhlanalytical.com & dupont@dhlanalytical.com
Call John DuPont if you have questions.

		Date/Time			Date/Time
Relinquished by:	[signature]	11/3/21 1800	Received by:	N/A	11/4/21 10:20
Relinquished by:			Received by:		

Box 14.7

BOX NOV 0 5 2021


LOGIN
5123888222
DHL ANALYTICAL
2300 DOUBLE CREEK DR
ROUND ROCK TX 78664

3 LBS 1 OF 1

SHIP TO:
SAMPLE RECEIVING
281 530 5656
ALS LABORATORY GROUP
10450 STANCLIFF RD.
HOUSTON TX 77099

BOX

TX 774 9-08

UPS GROUND
TRACKING #: 1Z 970 R40 03 1594 7246

BILLING: P/P

XOL 21.11.05 NV45 45.0A 10/2021*

APPENDIX F

90th Percentile Impoundment Concentrations from 2014 EPA Risk Report

quartiles developed were then combined into a single distribution representing all sites and all waste types, from which a 90th percentile concentration was drawn.

Table 3-1. 90th Percentile Concentrations Used for Screening Analysis

Constituent	Impoundment Pore Water (mg/L)	Impoundment Wastewater (mg/L)	Whole Waste (mg/kg)
Aluminum	12.3	2.3	91,500
Ammonia	5.1	–	–
Antimony	0.04	0.02	47.0
Arsenic	0.78	0.13	106
Barium	0.21	0.43	1,103
Beryllium	0.001	0.001	18.3
Boron	97.8	36.2	388
Cadmium	0.06	0.003	3.8
Calcium	592	577	114,750
Chloride	2,023	345	384
Chromium	0.2	0.03	153
Cobalt	0.05	0.02	65.9
Copper	0.13	0.01	226
Fluoride	21.3	–	25
Iron	11.9	0.04	42,426
Lanthanum	–	–	58.6
Lead	0.10	0.0006	75.3
Lithium	0.45	1.99	–
Magnesium	174	1,990	17,550
Manganese	1.8	0.56	413
Mercury	0.000007	0.00003	1.1
Molybdenum	7.1	0.42	31.0
Nickel	0.3	0.07	199
Nitrate	13.7	–	0.25
Nitrite	5.0	–	–
Potassium	221	40	9,622
Selenium	0.32	0.10	18.2
Silicon	19.0	12.7	262,700
Silver	0.005	0.0001	11.1
Sodium	3,288	743	3,557

Table 3-1. 90th Percentile Concentrations Used for Screening Analysis

Constituent	Impoundment Pore Water (mg/L)	Impoundment Wastewater (mg/L)	Whole Waste (mg/kg)
Strontium	9.1	4.3	891
Sulfate	4,398	10,400	9,630
Sulfide	–	–	26.2
Sulfur	3,842	–	36,000
Thallium	0.003	0.009	33.9
Uranium	0.01	0.004	5.0
Vanadium	0.52	0.23	562
Zinc	0.19	0.06	269

These 90th percentile values represent the concentrations present in and released from CCR wastes. Impoundment pore water is the water present within interstitial spaces of the settled CCRs. Impoundment wastewater is the free water ponded on top of the settled CCR waste. Whole waste represents the concentrations present within CCRs at the time of generation. However, most receptors will not come in direct contact with CCR wastes. Instead, receptors are exposed to environmental media, such as air; soil and water, that have been contaminated by releases from these wastes. To estimate the concentrations that may be present in these environmental media, EPA used conservative assumptions to account for fate and transport of COPCs through the environment. The calculation of these media-specific exposure concentrations are discussed in the following subsections.

3.2 Ambient Air Screening

This subsection summarizes the screening for exposure pathways associated with two management scenarios: uncontrolled and controlled releases. Uncontrolled releases occur when no action is taken to reduce particulate emissions. Controlled releases occur when management practices are put in place to minimize the rate of particulates emissions. The controls considered in this analysis include wetting and/or the use of surfactants.[10] Yet, even with the best available management practices, some emissions may still occur. Relevant exposure pathways include human inhalation of particulate matter and any COPCs contained therein. The greatest source of these pathways are landfills during operation, as water cover for impoundments and postclosure cap for landfills will limit the release of particulate matter. Therefore, EPA screened these pathways for landfills and the results were also used to identify any COPCs for surface impoundments.

[10] Surfactants refer to compounds that lower the surface tension (or interfacial tension) between a liquid and a solid, and can increase the effectiveness of water as a dust control mechanism.

APPENDIX G

Background Groundwater Laboratory Analytical Reports

June 14, 2019

Will Vienne
Golder
2201 Double Creek Dr #4004
Round Rock, Texas 78664
TEL: (512) 671-3434
FAX (512) 671-3446

Order No.: 1905168

RE: Luminant-MLSES Ash Ponds

Dear Will Vienne:

DHL Analytical, Inc. received 7 sample(s) on 5/15/2019 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAP except where noted in the Case Narrative. All non-NELAP methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-19-24

Table of Contents

DHL ANALYTICAL
2300 Double Creek Dr. ■ Round Rock, TX 78664
Phone (512) 388-8222 ■ FAX (512) 388-8229
Web: *www.dhlanalytical.com*
E-Mail: *login@dhlanalytical.com*

№ 86479

CHAIN-OF-CUSTODY

CLIENT: GOLDER
ADDRESS: 2201 DOUBLE CREEK DR, ROUND ROCK, TX 78664
PHONE: 512-671-3434 FAX/E-MAIL: 512-671-3446
DATA REPORTED TO: WILL VIENNE
ADDITIONAL REPORT COPIES TO:

DATE: 5-14-19 PAGE 1 OF 1
PO #:
DHL WORK ORDER #: 1905168
PROJECT LOCATION OR NAME: LUMINANT- MLSES ASH PONDS
CLENT PROJECT #: 19122262-C COLLECTOR: J. BRAYTON

Authorize 5% surcharge for TRRP Report? ☐ Yes ☐ No

S=SOIL P=PAINT
W=WATER SL=SLUDGE
A=AIR O=OTHER
L=LIQUID SO=SOLID
SE=SEDIMENT

ANALYSES: BTEX ☐ MTBE ☐ [METHOD 8021] / TPH 1005 ☐ TPH 1006 ☐ HOLD 1006 ☐ / GRO [METHOD 8015] ☐ DRO [METHOD 8105] ☐ / VOC 8260 ☐ VOC 624 ☐ VOC 8260/5035 ☐ / SVOC 8270 ☐ PAH 8270 ☐ HOLD PAH ☐ SVOC 625 ☐ / 8270 PEST ☐ 625 PEST/PCB ☐ 608 PCB ☐ / 8270 O-P PEST ☐ 8082 PCB ☐ 8270 PCB ☐ / 8321 HERB ☐ T PHOS, AMMONIA ☐ / METALS 6020 ☐ METALS 200.8 ☐ DISS. METALS ☐ / RCRA ☐ TX11 ☐ ____ ☐ / PH ☐ HEX CHROM ☐ ALKALINITY ☐ COD ☐ / CHLORIDE ☐ ANIONS ____ ☐ / TCLP-SVOC ☐ VOC ☐ PEST ☐ HERB ☐ / TCLP-METALS ☐ RCRA 8 ☐ TX-11 ☐ Pb ☐ / RCI ☐ FLASHPOINT ☐ DGAS ☐ / TDS ☐ TSS ☐ % MOISTURE ☐ CYANIDE ☐

Field Sample I.D.	DHL Lab #	Date	Time	Matrix	Container Type	# of Containers	HCl	HNO_3	H_2SO_4 ☐ NaOH ☐	ICE	UNPRESERVED	APPENDIX III & IV	ALK, NO_3, PO_4, Na, Mg, K	FERROUS, FERRIC IRON	FIELD NOTES
H-31	01	5-14-19	0740	W		7				X		X	X	X	
H-32	02	↓	0825	W		7				X		X	X	X	
H-27	03	↓	0940	W		7				X		X	X	X	
H-29	04	↓	1125	W		7				X		X	X	X	
H-28	05	↓	1230	W		7				X		X	X	X	
H-26	06	↓	1425	W		7				X		X	X	X	
H-33	07	↓	1530	W		7				X		X	X	X	

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
[signature]	5-14-19	Fed Ex
Fed Ex	5/15/19 0943	[signature]

☐ *DHL DISPOSAL @ $5.00 each* ☐ *Return*

TURN AROUND TIME
RUSH ☐ CALL FIRST
1 DAY ☐ CALL FIRST
2 DAY ☐
NORMAL ☒
OTHER ☐ ____

LABORATORY USE ONLY:
RECEIVING TEMP: 4.5 / 3.0 °C THERM #: 78
CUSTODY SEALS: ☐ BROKEN ☐ INTACT ☒ NOT USED
CARRIER: ☐ LONE STAR ☒ FEDEX ☐ UPS ☐ OTHER
☐ COURIER DELIVERY
☐ HAND DELIVERED

DHL COC Rev 1 | FEB 2010

Eric Lau

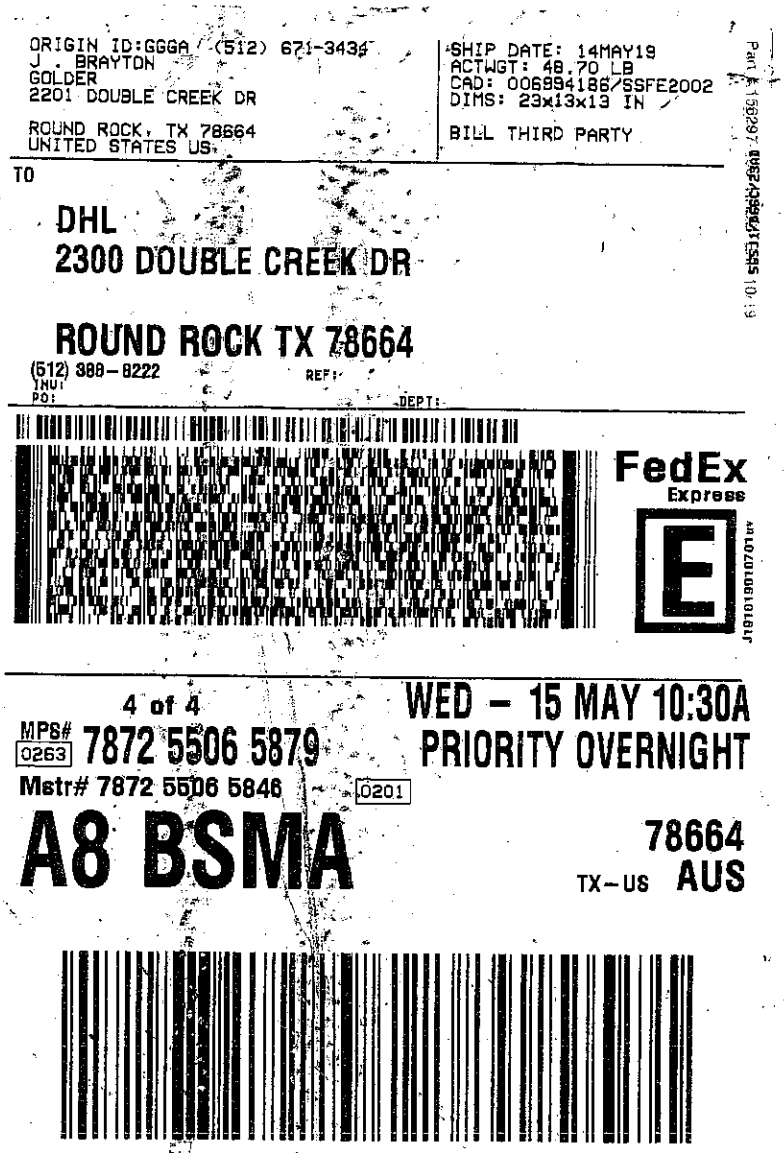
From: John DuPont
Sent: Tuesday, May 28, 2019 11:35 AM
To: Eric Lau
Subject: FW: CCR Analysis

Appendix III Parameters:
Metals (Ca and B)
Anions (Cl, F, and SO4)
TDS

Appendix IV Parameters:

Metals (As, Ba, Be, Cd, Co, Cr, Hg, Li, Mo, Pb, Sb, Se, and Tl)
Ra-226
Ra-228

From: Vienne, Will [mailto:William_Vienne@golder.com]
Sent: Tuesday, April 09, 2019 12:48 PM
To: John DuPont <dupont@dhlanalytical.com>
Subject: CCR Analysis



ORIGIN ID:GGGA (512) 671-3436
J . BRAYTON
GOLDER
2201 DOUBLE CREEK DR

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 14MAY19
ACTWGT: 48.70 LB
CAD: 006994186/SSFE2002
DIMS: 23x13x13 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-8222 REF:
INV:
PO: DEPT:

FedEx
Express

4 of 4
MPS# 0263 7872 5506 5879
Mstr# 7872 5506 5846 0201

WED - 15 MAY 10:30A
PRIORITY OVERNIGHT

A8 BSMA

78664
TX-US AUS

ORIGIN ID:GGGA (512) 671-3434
J . BRAYTON
GOLDER
2201 DOUBLE CREEK DR

ROUND ROCK, TX 78664
UNITED STATES US

SHIP DATE: 14MAY19
ACTWGT: 50.90 LB
CAD: 0068994166/SSFE2002
DIMS: 23x14x14 IN

BILL THIRD PARTY

TO

DHL
2300 DOUBLE CREEK DR

ROUND ROCK TX 78664
(512) 388-6222 REF:
INV:
PO: DEPT:

FedEx Express

2 of 4

WED - 15 MAY 10:30A
PRIORITY OVERNIGHT

MPS# 0263 7872 5506 5857
Mstr# 7872 5506 5846 0201

A8 BSMA

78664
TX-US AUS

DHL Analytical, Inc.

Sample Receipt Checklist

Client Name Golder | Date Received: 5/15/2019

Work Order Number 1905168 | Received by EL

Checklist completed by: _____ (Signature) 5/15/2019 (Date) | Reviewed by DL (Initials) 5/15/2019 (Date)

Carrier name FedEx 1day

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	4.5 °C
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH<2 acceptable upon receipt?	Yes ☑	No ☐	NA ☐ LOT # 11837
	Adjusted? no		Checked by EL
Water - ph>9 (S) or ph>10 (CN) acceptable upon receipt?	Yes ☐	No ☐	NA ☑ LOT #
	Adjusted?		Checked by

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

CLIENT: Golder
Project: Luminant-MLSES Ash Ponds
Lab Order: 1905168

CASE NARRATIVE

Samples were analyzed using the methods outlined in the following references:

Method SW6020A - Metals Analysis
Method SW7470A - Mercury Analysis
Method E300 - Anions Analysis
Method M2320 B - Alkalinity Analysis
Method M3500-Fe D - Ferrous Iron Analysis (this parameter is not NELAP certified)
Method M3500-Fe D - Ferric Iron (calculation) (this calculation is not NELAP certified).
Method M4500-P E - Orthophosphate Analysis
Method M2540C - TDS Analysis
Sub-contract - Radium-228 and Radium-226 analyses by methods E904 and SM 7500 Ra B M. Analyzed at Pace Analytical.

LOG IN

The samples were received and log-in performed on 5/15/19. A total of 7 samples were received. The samples arrived in good condition and were properly packaged.

METALS ANALYSIS

For Metals analysis performed on 5/20/19 and 5/21/19 the matrix spike and matrix spike duplicate recoveries were out of control limits for a total of four analytes. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

For Metals analysis peformed on 5/20/19 LCVL6-190520 was slightly above control limits for Sodium. This is flagged accordingly. The associated CCV6-190520 was within control limits for this analyte. No further corrective actions were taken.

ANIONS ANALYSIS

For Anions analysis performed on 5/15/19 (batch 90908) the matrix spike and matrix spike duplicate recoveries (1905167-02 MS/MSD) were out of control limits for Chloride and Sulfate. This was due to matrix effect. These are flagged accordingly in the QC summary report. The sample selected for the matrix spike and matrix spike duplicate was not from this work order. The LCS was within control limits for these analytes. No further corrective actions were taken.

FERRIC IRON (CALCULATION)

For Ferric Iron calculation the Ferrous Iron result was slightly higher than the total Iron result for sample H-31. This is within the acceptable variation limits. No further corrective actions were taken.

DHL Analytical, Inc.

Date: *14-Jun-19*

CLIENT: Golder
Project: Luminant-MLSES Ash Ponds
Lab Order: 1905168

Work Order Sample Summary

Lab Smp ID	Client Sample ID	Tag Number	Date Collected	Date Recved
1905168-01	H-31		05/14/19 07:40 AM	5/15/2019
1905168-02	H-32		05/14/19 08:25 AM	5/15/2019
1905168-03	H-27		05/14/19 09:40 AM	5/15/2019
1905168-04	H-29		05/14/19 11:25 AM	5/15/2019
1905168-05	H-28		05/14/19 12:30 PM	5/15/2019
1905168-06	H-26		05/14/19 02:25 PM	5/15/2019
1905168-07	H-33		05/14/19 03:30 PM	5/15/2019

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

PREP DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Number	Test Name	Prep Date	Batch ID
1905168-01A	H-31	05/14/19 07:40 AM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
	H-31	05/14/19 07:40 AM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-01B	H-31	05/14/19 07:40 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-31	05/14/19 07:40 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-31	05/14/19 07:40 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-31	05/14/19 07:40 AM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
	H-31	05/14/19 07:40 AM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-01C	H-31	05/14/19 07:40 AM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-31	05/14/19 07:40 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-31	05/14/19 07:40 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-31	05/14/19 07:40 AM	Aqueous	E300	Anion Preparation	05/16/19 09:16 AM	90935
	H-31	05/14/19 07:40 AM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-31	05/14/19 07:40 AM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953
1905168-02A	H-32	05/14/19 08:25 AM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
	H-32	05/14/19 08:25 AM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-02B	H-32	05/14/19 08:25 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-32	05/14/19 08:25 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-32	05/14/19 08:25 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-32	05/14/19 08:25 AM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-02C	H-32	05/14/19 08:25 AM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-32	05/14/19 08:25 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-32	05/14/19 08:25 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-32	05/14/19 08:25 AM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-32	05/14/19 08:25 AM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953
1905168-03A	H-27	05/14/19 09:40 AM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-03B	H-27	05/14/19 09:40 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-27	05/14/19 09:40 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-27	05/14/19 09:40 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

PREP DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Number	Test Name	Prep Date	Batch ID
1905168-03B	H-27	05/14/19 09:40 AM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-03C	H-27	05/14/19 09:40 AM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-27	05/14/19 09:40 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-27	05/14/19 09:40 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-27	05/14/19 09:40 AM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-27	05/14/19 09:40 AM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953
1905168-04A	H-29	05/14/19 11:25 AM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-04B	H-29	05/14/19 11:25 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-29	05/14/19 11:25 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-29	05/14/19 11:25 AM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-29	05/14/19 11:25 AM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-04C	H-29	05/14/19 11:25 AM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-29	05/14/19 11:25 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-29	05/14/19 11:25 AM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-29	05/14/19 11:25 AM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-29	05/14/19 11:25 AM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953
1905168-05A	H-28	05/14/19 12:30 PM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-05B	H-28	05/14/19 12:30 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-28	05/14/19 12:30 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-28	05/14/19 12:30 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-28	05/14/19 12:30 PM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-05C	H-28	05/14/19 12:30 PM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-28	05/14/19 12:30 PM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-28	05/14/19 12:30 PM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-28	05/14/19 12:30 PM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-28	05/14/19 12:30 PM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953
1905168-06A	H-26	05/14/19 02:25 PM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-06B	H-26	05/14/19 02:25 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

PREP DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Number	Test Name	Prep Date	Batch ID
1905168-06B	H-26	05/14/19 02:25 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-26	05/14/19 02:25 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-26	05/14/19 02:25 PM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-06C	H-26	05/14/19 02:25 PM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-26	05/14/19 02:25 PM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-26	05/14/19 02:25 PM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-26	05/14/19 02:25 PM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-26	05/14/19 02:25 PM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953
1905168-07A	H-33	05/14/19 03:30 PM	Aqueous	M3500-Fe	Ferrous Iron Prep Water	05/20/19 02:56 PM	91002
1905168-07B	H-33	05/14/19 03:30 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-33	05/14/19 03:30 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-33	05/14/19 03:30 PM	Aqueous	SW3005A	Aq Prep Metals : ICP-MS	05/17/19 08:40 AM	90959
	H-33	05/14/19 03:30 PM	Aqueous	SW7470A	Mercury Aq Prep	05/21/19 09:56 AM	91017
1905168-07C	H-33	05/14/19 03:30 PM	Aqueous	M2320 B	Alkalinity Preparation	05/16/19 10:12 AM	90940
	H-33	05/14/19 03:30 PM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-33	05/14/19 03:30 PM	Aqueous	E300	Anion Preparation	05/15/19 09:07 AM	90908
	H-33	05/14/19 03:30 PM	Aqueous	M4500-P E	Orthophosphate Prep	05/15/19 12:12 PM	90921
	H-33	05/14/19 03:30 PM	Aqueous	M2540C	TDS Preparation	05/16/19 03:23 PM	90953

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
1905168-01A	H-31	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-31	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:55 PM	UV/VIS_2_190520A
	H-31	Aqueous	M3500-Fe D	Ferrous Iron	91002	100	05/20/19 04:11 PM	UV/VIS_2_190520A
1905168-01B	H-31	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:16 AM	CETAC2_HG_190522A
	H-31	Aqueous	SW7470A	Mercury Total: Aqueous	91017	5	05/22/19 11:21 AM	CETAC2_HG_190522A
	H-31	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:43 PM	ICP-MS4_190520B
	H-31	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	50	05/21/19 12:54 PM	ICP-MS5_190521A
	H-31	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:51 PM	ICP-MS5_190521A
1905168-01C	H-31	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:13 PM	TITRATOR_190516A
	H-31	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 02:27 PM	IC2_190515A
	H-31	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 05:55 PM	IC2_190515A
	H-31	Aqueous	E300	Anions by IC method - Water	90935	100	05/16/19 05:42 PM	IC4_190516A
	H-31	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 02:47 PM	UV/VIS_2_190515B
	H-31	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D
1905168-02A	H-32	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-32	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:55 PM	UV/VIS_2_190520A
	H-32	Aqueous	M3500-Fe D	Ferrous Iron	91002	5	05/20/19 04:11 PM	UV/VIS_2_190520A
1905168-02B	H-32	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:27 AM	CETAC2_HG_190522A
	H-32	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:53 PM	ICP-MS5_190521A
	H-32	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	10	05/21/19 12:56 PM	ICP-MS5_190521A
	H-32	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:45 PM	ICP-MS4_190520B
1905168-02C	H-32	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:15 PM	TITRATOR_190516A
	H-32	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 02:43 PM	IC2_190515A
	H-32	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 06:11 PM	IC2_190515A
	H-32	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 12:49 PM	UV/VIS_2_190515B
	H-32	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
1905168-03A	H-27	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-27	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:56 PM	UV/VIS_2_190520A
1905168-03B	H-27	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:29 AM	CETAC2_HG_190522A
	H-27	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:47 PM	ICP-MS4_190520B
	H-27	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	10	05/21/19 12:59 PM	ICP-MS5_190521A
	H-27	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:14 PM	ICP-MS5_190521A
1905168-03C	H-27	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:20 PM	TITRATOR_190516A
	H-27	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 02:59 PM	IC2_190515A
	H-27	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 06:27 PM	IC2_190515A
	H-27	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 12:49 PM	UV/VIS_2_190515B
	H-27	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D
1905168-04A	H-29	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-29	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:56 PM	UV/VIS_2_190520A
1905168-04B	H-29	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:31 AM	CETAC2_HG_190522A
	H-29	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:49 PM	ICP-MS4_190520B
	H-29	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:55 PM	ICP-MS5_190521A
	H-29	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	20	05/21/19 01:01 PM	ICP-MS5_190521A
1905168-04C	H-29	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:23 PM	TITRATOR_190516A
	H-29	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 03:15 PM	IC2_190515A
	H-29	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 06:43 PM	IC2_190515A
	H-29	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 12:49 PM	UV/VIS_2_190515B
	H-29	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D
1905168-05A	H-28	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-28	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:57 PM	UV/VIS_2_190520A
1905168-05B	H-28	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:34 AM	CETAC2_HG_190522A
	H-28	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	20	05/21/19 01:03 PM	ICP-MS5_190521A

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
1905168-05B	H-28	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:57 PM	ICP-MS5_190521A
	H-28	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:51 PM	ICP-MS4_190520B
1905168-05C	H-28	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:27 PM	TITRATOR_190516A
	H-28	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 03:31 PM	IC2_190515A
	H-28	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 06:59 PM	IC2_190515A
	H-28	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 12:50 PM	UV/VIS_2_190515B
	H-28	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D
1905168-06A	H-26	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-26	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:57 PM	UV/VIS_2_190520A
1905168-06B	H-26	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:36 AM	CETAC2_HG_190522A
	H-26	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:53 PM	ICP-MS4_190520B
	H-26	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	10	05/21/19 01:05 PM	ICP-MS5_190521A
	H-26	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:16 PM	ICP-MS5_190521A
1905168-06C	H-26	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:42 PM	TITRATOR_190516A
	H-26	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 03:47 PM	IC2_190515A
	H-26	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 07:15 PM	IC2_190515A
	H-26	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 12:50 PM	UV/VIS_2_190515B
	H-26	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D
1905168-07A	H-33	Aqueous	M3500-Fe D	Ferric Iron (Calculated)	91002	1	05/24/19	UV/VIS_2_190524A
	H-33	Aqueous	M3500-Fe D	Ferrous Iron	91002	1	05/20/19 03:58 PM	UV/VIS_2_190520A
1905168-07B	H-33	Aqueous	SW7470A	Mercury Total: Aqueous	91017	1	05/22/19 10:38 AM	CETAC2_HG_190522A
	H-33	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/20/19 03:54 PM	ICP-MS4_190520B
	H-33	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	10	05/21/19 01:08 PM	ICP-MS5_190521A
	H-33	Aqueous	SW6020A	Trace Metals: ICP-MS - Water	90959	1	05/21/19 02:19 PM	ICP-MS5_190521A
1905168-07C	H-33	Aqueous	M2320 B	Alkalinity	90940	1	05/16/19 04:49 PM	TITRATOR_190516A
	H-33	Aqueous	E300	Anions by IC method - Water	90908	10	05/15/19 04:03 PM	IC2_190515A
	H-33	Aqueous	E300	Anions by IC method - Water	90908	1	05/15/19 07:31 PM	IC2_190515A

Lab Order: 1905168
Client: Golder
Project: Luminant-MLSES Ash Ponds

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
1905168-07C	H-33	Aqueous	M4500-P E	Orthophosphate	90921	1	05/15/19 12:50 PM	UV/VIS_2_190515B
	H-33	Aqueous	M2540C	Total Dissolved Solids	90953	1	05/17/19 11:40 AM	WC_190517D

DHL Analytical, Inc.

Date: *14-Jun-19*

CLIENT:	Golder	**Client Sample ID:**	H-27
Project:	Luminant-MLSES Ash Ponds	**Lab ID:**	1905168-03
Project No:	19122262-C	**Collection Date:**	05/14/19 09:40 AM
Lab Order:	1905168	**Matrix:**	AQUEOUS

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
TRACE METALS: ICP-MS - WATER		**SW6020A**					Analyst: **RO**
Antimony	<0.000800	0.000800	0.00250		mg/L	1	05/20/19 03:47 PM
Arsenic	<0.00200	0.00200	0.00500		mg/L	1	05/20/19 03:47 PM
Barium	0.0208	0.00300	0.0100		mg/L	1	05/20/19 03:47 PM
Beryllium	<0.000300	0.000300	0.00100		mg/L	1	05/20/19 03:47 PM
Boron	0.350	0.0100	0.0300		mg/L	1	05/21/19 02:14 PM
Cadmium	<0.000300	0.000300	0.00100		mg/L	1	05/20/19 03:47 PM
Calcium	61.8	1.00	3.00		mg/L	10	05/21/19 12:59 PM
Chromium	<0.00200	0.00200	0.00500		mg/L	1	05/20/19 03:47 PM
Cobalt	<0.00300	0.00300	0.00500		mg/L	1	05/20/19 03:47 PM
Iron	0.0711	0.0300	0.100	J	mg/L	1	05/20/19 03:47 PM
Lead	<0.000300	0.000300	0.00100		mg/L	1	05/20/19 03:47 PM
Lithium	0.0678	0.00500	0.0100		mg/L	1	05/20/19 03:47 PM
Magnesium	47.3	1.00	3.00		mg/L	10	05/21/19 12:59 PM
Molybdenum	<0.00200	0.00200	0.00500		mg/L	1	05/21/19 02:14 PM
Potassium	3.01	0.100	0.300		mg/L	1	05/20/19 03:47 PM
Selenium	<0.00200	0.00200	0.00500		mg/L	1	05/20/19 03:47 PM
Sodium	123	1.00	3.00		mg/L	10	05/21/19 12:59 PM
Thallium	<0.000500	0.000500	0.00150		mg/L	1	05/20/19 03:47 PM
MERCURY TOTAL: AQUEOUS		**SW7470A**					Analyst: **BM**
Mercury	<0.0000800	0.0000800	0.000200		mg/L	1	05/22/19 10:29 AM
ANIONS BY IC METHOD - WATER		**E300**					Analyst: **JL**
Chloride	132	3.00	10.0		mg/L	10	05/15/19 02:59 PM
Fluoride	0.159	0.100	0.400	J	mg/L	1	05/15/19 06:27 PM
Nitrate-N	0.658	0.100	0.500		mg/L	1	05/15/19 06:27 PM
Sulfate	406	10.0	30.0		mg/L	10	05/15/19 02:59 PM
ALKALINITY		**M2320 B**					Analyst: **CC**
Alkalinity, Bicarbonate (As CaCO3)	49.0	10.0	20.0		mg/L @ pH 4.5	1	05/16/19 04:20 PM
Alkalinity, Carbonate (As CaCO3)	<10.0	10.0	20.0		mg/L @ pH 4.5	1	05/16/19 04:20 PM
Alkalinity, Hydroxide (As CaCO3)	<10.0	10.0	20.0		mg/L @ pH 4.5	1	05/16/19 04:20 PM
Alkalinity, Total (As CaCO3)	49.0	20.0	20.0		mg/L @ pH 4.5	1	05/16/19 04:20 PM
FERRIC IRON (CALCULATED)		**M3500-FE D**					Analyst: **CAC**
Iron, Ferric	0.0711	0.0500	0.100	JN	mg/L	1	05/24/19
FERROUS IRON		**M3500-FE D**					Analyst: **BTJ**
Iron, Ferrous	<0.0500	0.0500	0.100	N	mg/L	1	05/20/19 03:56 PM

Qualifiers:

*	Value exceeds TCLP Maximum Concentration Level	C	Sample Result or QC discussed in the Case Narrative
DF	Dilution Factor	E	TPH pattern not Gas or Diesel Range Pattern
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	RL	Reporting Limit
S	Spike Recovery outside control limits	N	Parameter not NELAP certified

DHL Analytical, Inc.

Date: *14-Jun-19*

CLIENT:	Golder	**Client Sample ID:**	H-27
Project:	Luminant-MLSES Ash Ponds	**Lab ID:**	1905168-03
Project No:	19122262-C	**Collection Date:**	05/14/19 09:40 AM
Lab Order:	1905168	**Matrix:**	AQUEOUS

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
ORTHOPHOSPHATE		**M4500-P E**					Analyst: **CC**
Phosphorus, Total Orthophosphate (As P)	0.126	0.0300	0.100		mg/L	1	05/15/19 12:49 PM
TOTAL DISSOLVED SOLIDS		**M2540C**					Analyst: **JS**
Total Dissolved Solids (Residue, Filterable)	897	10.0	10.0		mg/L	1	05/17/19 11:40 AM

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	C	Sample Result or QC discussed in the Case Narrative
	DF	Dilution Factor	E	TPH pattern not Gas or Diesel Range Pattern
	J	Analyte detected between MDL and RL	MDL	Method Detection Limit
	ND	Not Detected at the Method Detection Limit	RL	Reporting Limit
	S	Spike Recovery outside control limits	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC2_HG_190522A

The QC data in batch 91017 applies to the following samples: 1905168-01B, 1905168-02B, 1905168-03B, 1905168-04B, 1905168-05B, 1905168-06B, 1905168-07B

Sample ID **MB-91017** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **MBLK** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 10:02:31 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	<0.0000800	0.000200								

Sample ID **LCS-91017** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCS** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 10:04:46 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00187	0.000200	0.00200	0	93.5	85	115			

Sample ID **LCSD-91017** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **LCSD** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 10:07:02 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00186	0.000200	0.00200	0	93.0	85	115	0.536	15	

Sample ID **1905168-01B MS** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **MS** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 11:23:23 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00196	0.00100	0.00200	0	97.8	80	120			

Sample ID **1905168-01B MSD** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **MSD** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 11:25:39 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00194	0.00100	0.00200	0	97.0	80	120	0.770	15	

Sample ID **1905168-01B SD** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **SD** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 11:27:56 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	<0.00200	0.00500	0	0				0	10	

Sample ID **1905168-01B PDS** Batch ID: **91017** TestNo: **SW7470A** Units: **mg/L**
SampType: **PDS** Run ID: **CETAC2_HG_190522A** Analysis Date: **5/22/2019 11:30:13 AM** Prep Date: **5/21/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0122	0.00100	0.0125	0	97.6	85	115			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC2_HG_190522A

Sample ID **ICV-190522**	Batch ID: **R104223**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **ICV**	Run ID: **CETAC2_HG_190522A**	Analysis Date: **5/22/2019 9:57:56 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00383	0.000200	0.00400	0	95.8	90	110			

Sample ID **CCV1-190522**	Batch ID: **R104223**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **CCV**	Run ID: **CETAC2_HG_190522A**	Analysis Date: **5/22/2019 10:41:04 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00202	0.000200	0.00200	0	101	90	110			

Sample ID **CCV2-190522**	Batch ID: **R104223**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **CCV**	Run ID: **CETAC2_HG_190522A**	Analysis Date: **5/22/2019 11:08:23 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00203	0.000200	0.00200	0	102	90	110			

Sample ID **CCV3-190522**	Batch ID: **R104223**	TestNo: **SW7470A**	Units: **mg/L**
SampType: **CCV**	Run ID: **CETAC2_HG_190522A**	Analysis Date: **5/22/2019 2:51:11 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00203	0.000200	0.00200	0	102	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: **ICP-MS4_190520B**

The QC data in batch 90959 applies to the following samples: 1905168-01B, 1905168-02B, 1905168-03B, 1905168-04B, 1905168-05B, 1905168-06B, 1905168-07B

Sample ID	**MB-90959**	Batch ID:	**90959**	TestNo:	**SW6020A**	Units:	**mg/L**
SampType:	**MBLK**	Run ID:	**ICP-MS4_190520B**	Analysis Date:	**5/20/2019 3:23:00 PM**	Prep Date:	**5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	<0.000800	0.00250								
Arsenic	<0.00200	0.00500								
Barium	<0.00300	0.0100								
Beryllium	<0.000300	0.00100								
Cadmium	<0.000300	0.00100								
Calcium	<0.100	0.300								
Chromium	<0.00200	0.00500								
Cobalt	<0.00300	0.00500								
Iron	<0.0300	0.100								
Lead	<0.000300	0.00100								
Lithium	<0.00500	0.0100								
Magnesium	<0.100	0.300								
Potassium	<0.100	0.300								
Selenium	<0.00200	0.00500								
Sodium	<0.100	0.300								
Thallium	<0.000500	0.00150								

Sample ID	**LCS-90959**	Batch ID:	**90959**	TestNo:	**SW6020A**	Units:	**mg/L**
SampType:	**LCS**	Run ID:	**ICP-MS4_190520B**	Analysis Date:	**5/20/2019 3:27:00 PM**	Prep Date:	**5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.190	0.00250	0.200	0	94.8	80	120			
Arsenic	0.204	0.00500	0.200	0	102	80	120			
Barium	0.190	0.0100	0.200	0	94.9	80	120			
Beryllium	0.211	0.00100	0.200	0	105	80	120			
Cadmium	0.192	0.00100	0.200	0	95.8	80	120			
Calcium	4.65	0.300	5.00	0	93.1	80	120			
Chromium	0.195	0.00500	0.200	0	97.7	80	120			
Cobalt	0.203	0.00500	0.200	0	101	80	120			
Iron	5.14	0.100	5.00	0	103	80	120			
Lead	0.187	0.00100	0.200	0	93.6	80	120			
Lithium	0.217	0.0100	0.200	0	108	80	120			
Magnesium	5.03	0.300	5.00	0	101	80	120			
Potassium	5.02	0.300	5.00	0	100	80	120			
Selenium	0.204	0.00500	0.200	0	102	80	120			
Sodium	5.07	0.300	5.00	0	101	80	120			
Thallium	0.199	0.00150	0.200	0	99.7	80	120			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_190520B

Sample ID **LCSD-90959**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCSD**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 3:29:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.195	0.00250	0.200	0	97.7	80	120	2.98	15	
Arsenic	0.201	0.00500	0.200	0	100	80	120	1.34	15	
Barium	0.194	0.0100	0.200	0	97.2	80	120	2.37	15	
Beryllium	0.210	0.00100	0.200	0	105	80	120	0.345	15	
Cadmium	0.198	0.00100	0.200	0	98.8	80	120	3.14	15	
Calcium	4.68	0.300	5.00	0	93.5	80	120	0.492	15	
Chromium	0.198	0.00500	0.200	0	99.1	80	120	1.40	15	
Cobalt	0.200	0.00500	0.200	0	100	80	120	1.46	15	
Iron	5.15	0.100	5.00	0	103	80	120	0.209	15	
Lead	0.190	0.00100	0.200	0	95.0	80	120	1.54	15	
Lithium	0.211	0.0100	0.200	0	106	80	120	2.37	15	
Magnesium	5.15	0.300	5.00	0	103	80	120	2.30	15	
Potassium	5.07	0.300	5.00	0	101	80	120	1.08	15	
Selenium	0.200	0.00500	0.200	0	99.9	80	120	1.96	15	
Sodium	5.10	0.300	5.00	0	102	80	120	0.502	15	
Thallium	0.200	0.00150	0.200	0	100	80	120	0.279	15	

Sample ID **1905178-02C SD**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **SD**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 3:37:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	<0.00400	0.0125	0	0				0	10	
Arsenic	0.0115	0.0250	0	0.0113				1.19	10	
Barium	0.0249	0.0500	0	0.0269				7.62	10	
Beryllium	<0.00150	0.00500	0	0				0	10	
Cadmium	<0.00150	0.00500	0	0				0	10	
Chromium	0.0104	0.0250	0	0.0104				0.596	10	
Cobalt	<0.0150	0.0250	0	0				0	10	
Iron	0.313	0.500	0	0.303				3.55	10	
Lead	<0.00150	0.00500	0	0				0	10	
Lithium	0.0378	0.0500	0	0.0361				4.57	10	
Potassium	1.53	1.50	0	1.52				0.244	10	
Selenium	<0.0100	0.0250	0	0				0	10	
Thallium	<0.00250	0.00750	0	0				0	10	

Sample ID **1905178-02C PDS**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **PDS**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 3:56:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.193	0.00250	0.200	0	96.4	80	120			
Arsenic	0.209	0.00500	0.200	0.0113	98.9	80	120			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_190520B

Sample ID **1905178-02C PDS**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **PDS**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 3:56:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.214	0.0100	0.200	0.0269	93.7	80	120			
Beryllium	0.184	0.00100	0.200	0	91.9	80	120			
Cadmium	0.184	0.00100	0.200	0	91.8	80	120			
Chromium	0.198	0.00500	0.200	0.0104	93.6	80	120			
Cobalt	0.193	0.00500	0.200	0	96.5	80	120			
Iron	5.19	0.100	5.00	0.303	97.7	80	120			
Lead	0.185	0.00100	0.200	0	92.4	80	120			
Lithium	0.224	0.0100	0.200	0.0361	93.9	80	120			
Potassium	6.27	0.300	5.00	1.52	94.9	80	120			
Selenium	0.195	0.00500	0.200	0	97.6	80	120			
Thallium	0.203	0.00150	0.200	0	101	80	120			

Sample ID **1905178-02C MS**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **MS**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 3:58:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.197	0.00250	0.200	0	98.3	80	120			
Arsenic	0.217	0.00500	0.200	0.0113	103	80	120			
Barium	0.223	0.0100	0.200	0.0269	97.8	80	120			
Beryllium	0.187	0.00100	0.200	0	93.6	80	120			
Cadmium	0.185	0.00100	0.200	0	92.5	80	120			
Calcium	65.6	0.300	5.00	62.5	62.2	80	120			S
Chromium	0.198	0.00500	0.200	0.0104	93.7	80	120			
Cobalt	0.196	0.00500	0.200	0	98.1	80	120			
Iron	5.25	0.100	5.00	0.303	98.9	80	120			
Lead	0.188	0.00100	0.200	0	93.9	80	120			
Lithium	0.221	0.0100	0.200	0.0361	92.5	80	120			
Magnesium	65.8	0.300	5.00	63.5	45.8	80	120			S
Potassium	6.56	0.300	5.00	1.52	101	80	120			
Selenium	0.204	0.00500	0.200	0	102	80	120			
Sodium	223	0.300	5.00	229	-120	80	120			S
Thallium	0.201	0.00150	0.200	0	100	80	120			

Sample ID **1905178-02C MSD**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **MSD**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 4:00:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.199	0.00250	0.200	0	99.4	80	120	1.06	15	
Arsenic	0.214	0.00500	0.200	0.0113	101	80	120	1.22	15	
Barium	0.228	0.0100	0.200	0.0269	100	80	120	2.27	15	
Beryllium	0.186	0.00100	0.200	0	92.8	80	120	0.831	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_190520B

Sample ID **1905178-02C MSD** Batch ID: **90959** TestNo: **SW6020A** Units: **mg/L**
SampType: **MSD** Run ID: **ICP-MS4_190520B** Analysis Date: **5/20/2019 4:00:00 PM** Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cadmium	0.188	0.00100	0.200	0	94.1	80	120	1.65	15	
Calcium	65.6	0.300	5.00	62.5	61.4	80	120	0.058	15	S
Chromium	0.197	0.00500	0.200	0.0104	93.2	80	120	0.455	15	
Cobalt	0.195	0.00500	0.200	0	97.6	80	120	0.571	15	
Iron	5.20	0.100	5.00	0.303	97.9	80	120	0.922	15	
Lead	0.186	0.00100	0.200	0	93.1	80	120	0.842	15	
Lithium	0.227	0.0100	0.200	0.0361	95.5	80	120	2.65	15	
Magnesium	66.6	0.300	5.00	63.5	62.8	80	120	1.28	15	S
Potassium	6.53	0.300	5.00	1.52	100	80	120	0.365	15	
Selenium	0.201	0.00500	0.200	0	101	80	120	1.07	15	
Sodium	224	0.300	5.00	229	-105	80	120	0.347	15	S
Thallium	0.205	0.00150	0.200	0	103	80	120	2.13	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_190520B

Sample ID **ICV-190520**	Batch ID: **R104182**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **ICV**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 11:23:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.0968	0.00250	0.100	0	96.8	90	110			
Arsenic	0.0991	0.00500	0.100	0	99.1	90	110			
Barium	0.0948	0.0100	0.100	0	94.8	90	110			
Beryllium	0.102	0.00100	0.100	0	102	90	110			
Cadmium	0.0974	0.00100	0.100	0	97.4	90	110			
Calcium	2.44	0.300	2.50	0	97.7	90	110			
Chromium	0.102	0.00500	0.100	0	102	90	110			
Cobalt	0.101	0.00500	0.100	0	101	90	110			
Iron	2.61	0.100	2.50	0	104	90	110			
Lead	0.0932	0.00100	0.100	0	93.2	90	110			
Lithium	0.106	0.0100	0.100	0	106	90	110			
Magnesium	2.50	0.300	2.50	0	100	90	110			
Potassium	2.53	0.300	2.50	0	101	90	110			
Selenium	0.0979	0.00500	0.100	0	97.9	90	110			
Sodium	2.59	0.300	2.50	0	104	90	110			
Thallium	0.0911	0.00150	0.100	0	91.1	90	110			

Sample ID **LCVL-190520**	Batch ID: **R104182**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 11:29:00 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.00176	0.00250	0.00200	0	87.9	70	130			
Arsenic	0.00489	0.00500	0.00500	0	97.7	70	130			
Barium	0.00432	0.0100	0.00500	0	86.5	70	130			
Beryllium	0.000893	0.00100	0.00100	0	89.3	70	130			
Cadmium	0.000871	0.00100	0.00100	0	87.1	70	130			
Calcium	0.0919	0.300	0.100	0	91.9	70	130			
Chromium	0.00481	0.00500	0.00500	0	96.1	70	130			
Cobalt	0.00485	0.00500	0.00500	0	97.0	70	130			
Iron	0.107	0.100	0.100	0	107	70	130			
Lead	0.000831	0.00100	0.00100	0	83.1	70	130			
Lithium	0.0104	0.0100	0.0100	0	104	70	130			
Magnesium	0.0970	0.300	0.100	0	97.0	70	130			
Potassium	0.0964	0.300	0.100	0	96.4	70	130			
Selenium	0.00489	0.00500	0.00500	0	97.8	70	130			
Sodium	0.0958	0.300	0.100	0	95.8	70	130			
Thallium	0.000816	0.00150	0.00100	0	81.6	70	130			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_190520B

Sample ID **CCV5-190520**	Batch ID: **R104182**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 2:53:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.195	0.00250	0.200	0	97.6	90	110			
Arsenic	0.203	0.00500	0.200	0	102	90	110			
Barium	0.193	0.0100	0.200	0	96.5	90	110			
Beryllium	0.202	0.00100	0.200	0	101	90	110			
Cadmium	0.197	0.00100	0.200	0	98.4	90	110			
Calcium	4.64	0.300	5.00	0	92.9	90	110			
Chromium	0.195	0.00500	0.200	0	97.5	90	110			
Cobalt	0.201	0.00500	0.200	0	100	90	110			
Iron	5.06	0.100	5.00	0	101	90	110			
Lead	0.192	0.00100	0.200	0	96.1	90	110			
Lithium	0.206	0.0100	0.200	0	103	90	110			
Magnesium	5.06	0.300	5.00	0	101	90	110			
Potassium	5.03	0.300	5.00	0	101	90	110			
Selenium	0.205	0.00500	0.200	0	102	90	110			
Sodium	5.17	0.300	5.00	0	103	90	110			
Thallium	0.199	0.00150	0.200	0	99.7	90	110			

Sample ID **LCVL5-190520**	Batch ID: **R104182**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 3:01:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.00174	0.00250	0.00200	0	87.2	70	130			
Arsenic	0.00487	0.00500	0.00500	0	97.5	70	130			
Barium	0.00423	0.0100	0.00500	0	84.6	70	130			
Beryllium	0.00110	0.00100	0.00100	0	110	70	130			
Cadmium	0.000921	0.00100	0.00100	0	92.1	70	130			
Calcium	0.0952	0.300	0.100	0	95.2	70	130			
Chromium	0.00485	0.00500	0.00500	0	97.1	70	130			
Cobalt	0.00489	0.00500	0.00500	0	97.9	70	130			
Iron	0.108	0.100	0.100	0	108	70	130			
Lead	0.000805	0.00100	0.00100	0	80.5	70	130			
Lithium	0.0108	0.0100	0.0100	0	108	70	130			
Magnesium	0.0983	0.300	0.100	0	98.3	70	130			
Potassium	0.0975	0.300	0.100	0	97.5	70	130			
Selenium	0.00517	0.00500	0.00500	0	103	70	130			
Sodium	0.102	0.300	0.100	0	102	70	130			
Thallium	0.000787	0.00150	0.00100	0	78.7	70	130			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS4_190520B

Sample ID **CCV6-190520**	Batch ID: **R104182**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 4:02:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.194	0.00250	0.200	0	96.9	90	110			
Arsenic	0.205	0.00500	0.200	0	102	90	110			
Barium	0.192	0.0100	0.200	0	96.2	90	110			
Beryllium	0.199	0.00100	0.200	0	99.7	90	110			
Cadmium	0.193	0.00100	0.200	0	96.3	90	110			
Calcium	4.67	0.300	5.00	0	93.4	90	110			
Chromium	0.194	0.00500	0.200	0	96.8	90	110			
Cobalt	0.203	0.00500	0.200	0	101	90	110			
Iron	5.07	0.100	5.00	0	101	90	110			
Lead	0.195	0.00100	0.200	0	97.6	90	110			
Lithium	0.204	0.0100	0.200	0	102	90	110			
Magnesium	5.01	0.300	5.00	0	100	90	110			
Potassium	4.98	0.300	5.00	0	99.6	90	110			
Selenium	0.205	0.00500	0.200	0	103	90	110			
Sodium	5.14	0.300	5.00	0	103	90	110			
Thallium	0.205	0.00150	0.200	0	102	90	110			

Sample ID **LCVL6-190520**	Batch ID: **R104182**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS4_190520B**	Analysis Date: **5/20/2019 4:06:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.00178	0.00250	0.00200	0	89.2	70	130			
Arsenic	0.00492	0.00500	0.00500	0	98.4	70	130			
Barium	0.00435	0.0100	0.00500	0	87.0	70	130			
Beryllium	0.00105	0.00100	0.00100	0	105	70	130			
Cadmium	0.000933	0.00100	0.00100	0	93.3	70	130			
Calcium	0.0988	0.300	0.100	0	98.8	70	130			
Chromium	0.00475	0.00500	0.00500	0	95.0	70	130			
Cobalt	0.00485	0.00500	0.00500	0	97.1	70	130			
Iron	0.107	0.100	0.100	0	107	70	130			
Lead	0.000828	0.00100	0.00100	0	82.8	70	130			
Lithium	0.0104	0.0100	0.0100	0	104	70	130			
Magnesium	0.0986	0.300	0.100	0	98.6	70	130			
Potassium	0.0940	0.300	0.100	0	94.0	70	130			
Selenium	0.00483	0.00500	0.00500	0	96.6	70	130			
Sodium	0.131	0.300	0.100	0	131	70	130			S
Thallium	0.000822	0.00150	0.00100	0	82.2	70	130			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_190521A

The QC data in batch 90959 applies to the following samples: 1905168-01B, 1905168-02B, 1905168-03B, 1905168-04B, 1905168-05B, 1905168-06B, 1905168-07B

Sample ID **MB-90959** Batch ID: **90959** TestNo: **SW6020A** Units: **mg/L**
SampType: **MBLK** Run ID: **ICP-MS5_190521A** Analysis Date: **5/21/2019 12:36:00 PM** Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	<0.0100	0.0300								
Molybdenum	<0.00200	0.00500								

Sample ID **LCS-90959** Batch ID: **90959** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCS** Run ID: **ICP-MS5_190521A** Analysis Date: **5/21/2019 12:38:00 PM** Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.201	0.0300	0.200	0	101	80	120			
Molybdenum	0.195	0.00500	0.200	0	97.3	80	120			

Sample ID **LCSD-90959** Batch ID: **90959** TestNo: **SW6020A** Units: **mg/L**
SampType: **LCSD** Run ID: **ICP-MS5_190521A** Analysis Date: **5/21/2019 12:41:00 PM** Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.208	0.0300	0.200	0	104	80	120	3.23	15	
Molybdenum	0.192	0.00500	0.200	0	96.2	80	120	1.18	15	

Sample ID **1905178-02C SD** Batch ID: **90959** TestNo: **SW6020A** Units: **mg/L**
SampType: **SD** Run ID: **ICP-MS5_190521A** Analysis Date: **5/21/2019 12:47:00 PM** Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	<1.00	3.00	0	0.525				0	10	
Calcium	70.4	30.0	0	68.2				3.15	10	
Magnesium	63.5	30.0	0	63.5				0.085	10	
Molybdenum	<0.200	0.500	0	0				0	10	
Sodium	227	30.0	0	233				2.75	10	

Sample ID **1905178-02C PDS** Batch ID: **90959** TestNo: **SW6020A** Units: **mg/L**
SampType: **PDS** Run ID: **ICP-MS5_190521A** Analysis Date: **5/21/2019 1:14:00 PM** Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	4.53	0.600	4.00	0.525	100	80	120			
Calcium	170	6.00	100	68.2	102	80	120			
Magnesium	161	6.00	100	63.5	97.1	80	120			
Molybdenum	3.64	0.100	4.00	0	90.9	80	120			
Sodium	331	6.00	100	233	98.2	80	120			

Qualifiers:

B	Analyte detected in the associated Method Blank
J	Analyte detected between MDL and RL
ND	Not Detected at the Method Detection Limit
RL	Reporting Limit
J	Analyte detected between SDL and RL
DF	Dilution Factor
MDL	Method Detection Limit
R	RPD outside accepted control limits
S	Spike Recovery outside control limits
N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_190521A

Sample ID **1905178-02C MS**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **MS**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 1:17:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.866	0.600	0.200	0.525	170	80	120			S
Molybdenum	0.192	0.100	0.200	0	96.0	80	120			

Sample ID **1905178-02C MSD**	Batch ID: **90959**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **MSD**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 1:19:00 PM**	Prep Date: **5/17/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.750	0.600	0.200	0.525	112	80	120	14.3	15	
Molybdenum	0.189	0.100	0.200	0	94.3	80	120	1.76	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_190521A

Sample ID **ICV-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **ICV**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 12:10:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.103	0.0300	0.100	0	103	90	110			
Calcium	2.52	0.300	2.50	0	101	90	110			
Iron	2.60	0.100	2.50	0	104	90	110			
Magnesium	2.49	0.300	2.50	0	99.7	90	110			
Molybdenum	0.0930	0.00500	0.100	0	93.0	90	110			
Sodium	2.56	0.300	2.50	0	103	90	110			

Sample ID **LCVL-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 12:15:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.0223	0.0300	0.0200	0	111	70	130			
Calcium	0.104	0.300	0.100	0	104	70	130			
Iron	0.0979	0.100	0.100	0	97.9	70	130			
Magnesium	0.0983	0.300	0.100	0	98.3	70	130			
Molybdenum	0.00464	0.00500	0.00500	0	92.8	70	130			
Sodium	0.0960	0.300	0.100	0	96.0	70	130			

Sample ID **CCV1-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 1:26:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.196	0.0300	0.200	0	98.1	90	110			
Calcium	4.90	0.300	5.00	0	98.0	90	110			
Iron	5.04	0.100	5.00	0	101	90	110			
Magnesium	4.94	0.300	5.00	0	98.8	90	110			
Molybdenum	0.193	0.00500	0.200	0	96.3	90	110			
Sodium	4.93	0.300	5.00	0	98.6	90	110			

Sample ID **LCVL1-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 1:30:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.0245	0.0300	0.0200	0	123	70	130			
Calcium	0.0976	0.300	0.100	0	97.6	70	130			
Iron	0.0980	0.100	0.100	0	98.0	70	130			
Magnesium	0.0940	0.300	0.100	0	94.0	70	130			
Molybdenum	0.00478	0.00500	0.00500	0	95.6	70	130			
Sodium	0.0986	0.300	0.100	0	98.6	70	130			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS5_190521A

Sample ID **CCV2-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 2:05:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.208	0.0300	0.200	0	104	90	110			
Molybdenum	0.201	0.00500	0.200	0	101	90	110			

Sample ID **LCVL2-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 2:09:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.0258	0.0300	0.0200	0	129	70	130			
Molybdenum	0.00474	0.00500	0.00500	0	94.7	70	130			

Sample ID **CCV3-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 2:34:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.199	0.0300	0.200	0	99.5	90	110			
Molybdenum	0.199	0.00500	0.200	0	99.7	90	110			

Sample ID **LCVL3-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 2:46:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Boron	0.0227	0.0300	0.0200	0	113	70	130			
Molybdenum	0.00484	0.00500	0.00500	0	96.8	70	130			

Sample ID **CCV4-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **CCV**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 3:00:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Molybdenum	0.199	0.00500	0.200	0	99.7	90	110			

Sample ID **LCVL4-190521**	Batch ID: **R104204**	TestNo: **SW6020A**	Units: **mg/L**
SampType: **LCVL**	Run ID: **ICP-MS5_190521A**	Analysis Date: **5/21/2019 3:05:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Molybdenum	0.00483	0.00500	0.00500	0	96.6	70	130			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_190515A

The QC data in batch 90908 applies to the following samples: 1905168-01C, 1905168-02C, 1905168-03C, 1905168-04C, 1905168-05C, 1905168-06C, 1905168-07C

Sample ID	**MB-90908**	Batch ID:	**90908**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MBLK**	Run ID:	**IC2_190515A**	Analysis Date:	**5/15/2019 10:10:50 AM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	<0.300	1.00								
Fluoride	<0.100	0.400								
Nitrate-N	<0.100	0.500								
Sulfate	<1.00	3.00								

Sample ID	**LCS-90908**	Batch ID:	**90908**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**LCS**	Run ID:	**IC2_190515A**	Analysis Date:	**5/15/2019 10:26:50 AM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.1	1.00	10.00	0	101	90	110			
Fluoride	4.00	0.400	4.000	0	99.9	90	110			
Nitrate-N	5.09	0.500	5.000	0	102	90	110			
Sulfate	30.4	3.00	30.00	0	101	90	110			

Sample ID	**LCSD-90908**	Batch ID:	**90908**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**LCSD**	Run ID:	**IC2_190515A**	Analysis Date:	**5/15/2019 10:42:50 AM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.2	1.00	10.00	0	102	90	110	0.674	20	
Fluoride	4.05	0.400	4.000	0	101	90	110	1.26	20	
Nitrate-N	5.08	0.500	5.000	0	102	90	110	0.146	20	
Sulfate	30.9	3.00	30.00	0	103	90	110	1.55	20	

Sample ID	**1905167-01CMS**	Batch ID:	**90908**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MS**	Run ID:	**IC2_190515A**	Analysis Date:	**5/15/2019 1:07:36 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	222	10.0	200.0	12.69	105	90	110			
Fluoride	211	4.00	200.0	0	106	90	110			
Nitrate-N	45.6	5.00	45.16	0	101	90	110			
Sulfate	239	30.0	200.0	41.32	98.7	90	110			

Sample ID	**1905167-01CMSD**	Batch ID:	**90908**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MSD**	Run ID:	**IC2_190515A**	Analysis Date:	**5/15/2019 1:23:36 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	221	10.0	200.0	12.69	104	90	110	0.308	20	
Fluoride	210	4.00	200.0	0	105	90	110	0.286	20	
Nitrate-N	45.8	5.00	45.16	0	101	90	110	0.495	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_190515A

Sample ID **1905167-01CMSD**	Batch ID: **90908**	TestNo: **E300**	Units: **mg/L**
SampType: **MSD**	Run ID: **IC2_190515A**	Analysis Date: **5/15/2019 1:23:36 PM**	Prep Date: **5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	237	30.0	200.0	41.32	97.7	90	110	0.821	20	

Sample ID **1905167-02CMS**	Batch ID: **90908**	TestNo: **E300**	Units: **mg/L**
SampType: **MS**	Run ID: **IC2_190515A**	Analysis Date: **5/15/2019 1:55:36 PM**	Prep Date: **5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	686	10.0	200.0	528.8	78.8	90	110			S
Fluoride	229	4.00	200.0	24.26	102	90	110			
Nitrate-N	56.2	5.00	45.16	10.55	101	90	110			
Sulfate	2520	30.0	200.0	0	1260	90	110			S

Sample ID **1905167-02CMSD**	Batch ID: **90908**	TestNo: **E300**	Units: **mg/L**
SampType: **MSD**	Run ID: **IC2_190515A**	Analysis Date: **5/15/2019 2:11:36 PM**	Prep Date: **5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	688	10.0	200.0	528.8	79.8	90	110	0.292	20	S
Fluoride	229	4.00	200.0	24.26	102	90	110	0.251	20	
Nitrate-N	57.3	5.00	45.16	10.55	103	90	110	1.85	20	
Sulfate	<10.0	30.0	200.0	0	0	90	110	0	20	S

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: IC2_190515A

Sample ID **ICV-190515**	Batch ID: **R104097**	TestNo: **E300**	Units: **mg/L**
SampType: **ICV**	Run ID: **IC2_190515A**	Analysis Date: **5/15/2019 9:38:50 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	25.8	1.00	25.00	0	103	90	110			
Fluoride	10.3	0.400	10.00	0	103	90	110			
Nitrate-N	13.0	0.500	12.50	0	104	90	110			
Sulfate	77.8	3.00	75.00	0	104	90	110			

Sample ID **CCV1-190515**	Batch ID: **R104097**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_190515A**	Analysis Date: **5/15/2019 4:51:36 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.4	1.00	10.00	0	104	90	110			
Fluoride	4.15	0.400	4.000	0	104	90	110			
Nitrate-N	5.13	0.500	5.000	0	103	90	110			
Sulfate	30.8	3.00	30.00	0	103	90	110			

Sample ID **CCV2-190515**	Batch ID: **R104097**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC2_190515A**	Analysis Date: **5/15/2019 8:35:35 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	10.6	1.00	10.00	0	106	90	110			
Fluoride	4.20	0.400	4.000	0	105	90	110			
Nitrate-N	5.20	0.500	5.000	0	104	90	110			
Sulfate	31.5	3.00	30.00	0	105	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: IC4_190516A

The QC data in batch 90935 applies to the following samples: 1905168-01C

Sample ID	**MB-90935**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MBLK**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 10:26:21 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	<1.00	3.00								

Sample ID	**LCS-90935**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**LCS**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 10:42:21 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	29.5	3.00	30.00	0	98.3	90	110			

Sample ID	**LCSD-90935**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**LCSD**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 10:58:21 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	29.8	3.00	30.00	0	99.2	90	110	0.935	20	

Sample ID	**1905167-02CMS**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MS**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 5:10:27 PM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	4830	300	2000	2897	96.9	90	110			

Sample ID	**1905167-02CMSD**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MSD**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 5:26:27 PM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	4880	300	2000	2897	99.1	90	110	0.920	20	

Sample ID	**1905168-01CMS**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MS**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 5:58:26 PM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	4380	300	2000	2468	95.6	90	110			

Sample ID	**1905168-01CMSD**	Batch ID:	**90935**	TestNo:	**E300**	Units:	**mg/L**
SampType:	**MSD**	Run ID:	**IC4_190516A**	Analysis Date:	**5/16/2019 6:14:27 PM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	4390	300	2000	2468	96.2	90	110	0.273	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: IC4_190516A

Sample ID **ICV-190516**	Batch ID: **R104119**	TestNo: **E300**	Units: **mg/L**
SampType: **ICV**	Run ID: **IC4_190516A**	Analysis Date: **5/16/2019 9:54:21 AM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	74.5	3.00	75.00	0	99.4	90	110			

Sample ID **CCV1-190516**	Batch ID: **R104119**	TestNo: **E300**	Units: **mg/L**
SampType: **CCV**	Run ID: **IC4_190516A**	Analysis Date: **5/16/2019 9:10:26 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	30.2	3.00	30.00	0	101	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_190516A

The QC data in batch 90940 applies to the following samples: 1905168-01C, 1905168-02C, 1905168-03C, 1905168-04C, 1905168-05C, 1905168-06C, 1905168-07C

Sample ID **MB-90940**	Batch ID: **90940**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.47**
SampType: **MBLK**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 2:00:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	<10.0	20.0								
Alkalinity, Carbonate (As CaCO3)	<10.0	20.0								
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0								
Alkalinity, Total (As CaCO3)	<20.0	20.0								

Sample ID **LCS-90940**	Batch ID: **90940**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.08**
SampType: **LCS**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 2:04:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	52.3	20.0	50.00	0	105	74	129			

Sample ID **1905134-01C DUP**	Batch ID: **90940**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.52**
SampType: **DUP**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 2:15:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	205	20.0	0	205.8				0.536	20	
Alkalinity, Carbonate (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Total (As CaCO3)	205	20.0	0	205.8				0.536	20	

Sample ID **1905168-05C DUP**	Batch ID: **90940**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.51**
SampType: **DUP**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 4:30:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Carbonate (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0	0				0	20	
Alkalinity, Total (As CaCO3)	<20.0	20.0	0	0				0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_190516A

Sample ID **ICV-190516**	Batch ID: **R104124**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.34**
SampType: **ICV**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 1:58:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	8.64	20.0	0							
Alkalinity, Carbonate (As CaCO3)	89.3	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	97.9	20.0	100.0	0	97.9	98	102			

Sample ID **CCV1-190516**	Batch ID: **R104124**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.25**
SampType: **CCV**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 3:39:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	21.7	20.0	0							
Alkalinity, Carbonate (As CaCO3)	76.8	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	98.5	20.0	100.0	0	98.5	90	110			

Sample ID **CCV2-190516**	Batch ID: **R104124**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.21**
SampType: **CCV**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 4:35:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	17.7	20.0	0							
Alkalinity, Carbonate (As CaCO3)	81.3	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	99.0	20.0	100.0	0	99.0	90	110			

Sample ID **CCV3-190516**	Batch ID: **R104124**	TestNo: **M2320 B**	Units: **mg/L @ pH 4.39**
SampType: **CCV**	Run ID: **TITRATOR_190516A**	Analysis Date: **5/16/2019 4:54:00 PM**	Prep Date: **5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	20.3	20.0	0							
Alkalinity, Carbonate (As CaCO3)	77.1	20.0	0							
Alkalinity, Hydroxide (As CaCO3)	<10.0	20.0	0							
Alkalinity, Total (As CaCO3)	97.4	20.0	100.0	0	97.4	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: UV/VIS_2_190515B

The QC data in batch 90921 applies to the following samples: 1905168-01C, 1905168-02C, 1905168-03C, 1905168-04C, 1905168-05C, 1905168-06C, 1905168-07C

Sample ID	**MB-90921**	Batch ID:	**90921**	TestNo:	**M4500-P E**	Units:	**mg/L**
SampType:	**MBLK**	Run ID:	**UV/VIS_2_190515B**	Analysis Date:	**5/15/2019 12:42:00 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	<0.0300	0.100								

Sample ID	**LCS-90921**	Batch ID:	**90921**	TestNo:	**M4500-P E**	Units:	**mg/L**
SampType:	**LCS**	Run ID:	**UV/VIS_2_190515B**	Analysis Date:	**5/15/2019 12:43:00 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	0.513	0.100	0.5000	0	103	80	120			

Sample ID	**LCSD-90921**	Batch ID:	**90921**	TestNo:	**M4500-P E**	Units:	**mg/L**
SampType:	**LCSD**	Run ID:	**UV/VIS_2_190515B**	Analysis Date:	**5/15/2019 12:43:00 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	0.504	0.100	0.5000	0	101	80	120	1.77	15	

Sample ID	**1905168-01CMS**	Batch ID:	**90921**	TestNo:	**M4500-P E**	Units:	**mg/L**
SampType:	**MS**	Run ID:	**UV/VIS_2_190515B**	Analysis Date:	**5/15/2019 12:45:00 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	0.587	0.100	0.5000	0.07700	102	80	120			

Sample ID	**1905168-01CMSD**	Batch ID:	**90921**	TestNo:	**M4500-P E**	Units:	**mg/L**
SampType:	**MSD**	Run ID:	**UV/VIS_2_190515B**	Analysis Date:	**5/15/2019 12:45:00 PM**	Prep Date:	**5/15/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	0.525	0.100	0.5000	0.07700	89.6	80	120	11.2	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: UV/VIS_2_190515B

Sample ID **ICV-190515**	Batch ID: **R104071**	TestNo: **M4500-P E**	Units: **mg/L**
SampType: **ICV**	Run ID: **UV/VIS_2_190515B**	Analysis Date: **5/15/2019 12:41:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	0.204	0.100	0.2000	0	102	85	115			

Sample ID **CCV1-190515**	Batch ID: **R104071**	TestNo: **M4500-P E**	Units: **mg/L**
SampType: **CCV**	Run ID: **UV/VIS_2_190515B**	Analysis Date: **5/15/2019 12:51:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phosphorus, Total Orthophosphate (As	0.509	0.100	0.5000	0	102	85	115			

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: UV/VIS_2_190520A

The QC data in batch 91002 applies to the following samples: 1905168-01A, 1905168-02A, 1905168-03A, 1905168-04A, 1905168-05A, 1905168-06A, 1905168-07A

Sample ID	**MB-91002**	Batch ID:	**91002**	TestNo:	**M3500-Fe D**	Units:	**mg/L**
SampType:	**MBLK**	Run ID:	**UV/VIS_2_190520A**	Analysis Date:	**5/20/2019 3:53:00 PM**	Prep Date:	**5/20/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	<0.0500	0.100								N

Sample ID	**LCS-91002**	Batch ID:	**91002**	TestNo:	**M3500-Fe D**	Units:	**mg/L**
SampType:	**LCS**	Run ID:	**UV/VIS_2_190520A**	Analysis Date:	**5/20/2019 3:53:00 PM**	Prep Date:	**5/20/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.0888	0.100	0.1000	0	88.8	85	115			N

Sample ID	**LCSD-91002**	Batch ID:	**91002**	TestNo:	**M3500-Fe D**	Units:	**mg/L**
SampType:	**LCSD**	Run ID:	**UV/VIS_2_190520A**	Analysis Date:	**5/20/2019 3:53:00 PM**	Prep Date:	**5/20/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.0879	0.100	0.1000	0	87.9	85	115	1.05	15	N

Sample ID	**1905185-11AMS**	Batch ID:	**91002**	TestNo:	**M3500-Fe D**	Units:	**mg/L**
SampType:	**MS**	Run ID:	**UV/VIS_2_190520A**	Analysis Date:	**5/20/2019 4:03:00 PM**	Prep Date:	**5/20/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.0860	0.100	0.1000	0	86.0	85	115			N

Sample ID	**1905185-11AMSD**	Batch ID:	**91002**	TestNo:	**M3500-Fe D**	Units:	**mg/L**
SampType:	**MSD**	Run ID:	**UV/VIS_2_190520A**	Analysis Date:	**5/20/2019 4:03:00 PM**	Prep Date:	**5/20/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.0861	0.100	0.1000	0	86.1	85	115	0.116	15	N

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: UV/VIS_2_190520A

Sample ID **ICV-190520**	Batch ID: **R104177**	TestNo: **M3500-Fe D**	Units: **mg/L**
SampType: **ICV**	Run ID: **UV/VIS_2_190520A**	Analysis Date: **5/20/2019 3:52:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.0875	0.100	0.1000	0	87.5	85	115			N

Sample ID **CCV1-190520**	Batch ID: **R104177**	TestNo: **M3500-Fe D**	Units: **mg/L**
SampType: **CCV**	Run ID: **UV/VIS_2_190520A**	Analysis Date: **5/20/2019 3:59:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.197	0.100	0.2000	0	98.4	85	115			N

Sample ID **CCV2-190520**	Batch ID: **R104177**	TestNo: **M3500-Fe D**	Units: **mg/L**
SampType: **CCV**	Run ID: **UV/VIS_2_190520A**	Analysis Date: **5/20/2019 4:12:00 PM**	Prep Date:

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron, Ferrous	0.183	0.100	0.2000	0	91.7	85	115			N

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

CLIENT: Golder
Work Order: 1905168
Project: Luminant-MLSES Ash Ponds

ANALYTICAL QC SUMMARY REPORT

RunID: WC_190517D

The QC data in batch 90953 applies to the following samples: 1905168-01C, 1905168-02C, 1905168-03C, 1905168-04C, 1905168-05C, 1905168-06C, 1905168-07C

Sample ID	**MB-90953**	Batch ID:	**90953**	TestNo:	**M2540C**	Units:	**mg/L**
SampType:	**MBLK**	Run ID:	**WC_190517D**	Analysis Date:	**5/17/2019 11:40:00 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	<10.0	10.0								

Sample ID	**LCS-90953**	Batch ID:	**90953**	TestNo:	**M2540C**	Units:	**mg/L**
SampType:	**LCS**	Run ID:	**WC_190517D**	Analysis Date:	**5/17/2019 11:40:00 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	745	10.0	745.6	0	99.9	90	113			

Sample ID	**1905167-02C-DUP**	Batch ID:	**90953**	TestNo:	**M2540C**	Units:	**mg/L**
SampType:	**DUP**	Run ID:	**WC_190517D**	Analysis Date:	**5/17/2019 11:40:00 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	5340	50.0	0	5375				0.747	5	

Sample ID	**1905168-02C-DUP**	Batch ID:	**90953**	TestNo:	**M2540C**	Units:	**mg/L**
SampType:	**DUP**	Run ID:	**WC_190517D**	Analysis Date:	**5/17/2019 11:40:00 AM**	Prep Date:	**5/16/2019**

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids (Residue, Filtera	940	50.0	0	910.0				3.24	5	

Qualifiers:

B	Analyte detected in the associated Method Blank	DF	Dilution Factor
J	Analyte detected between MDL and RL	MDL	Method Detection Limit
ND	Not Detected at the Method Detection Limit	R	RPD outside accepted control limits
RL	Reporting Limit	S	Spike Recovery outside control limits
J	Analyte detected between SDL and RL	N	Parameter not NELAP certified

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

June 10, 2019

DHL Analytical, Inc.

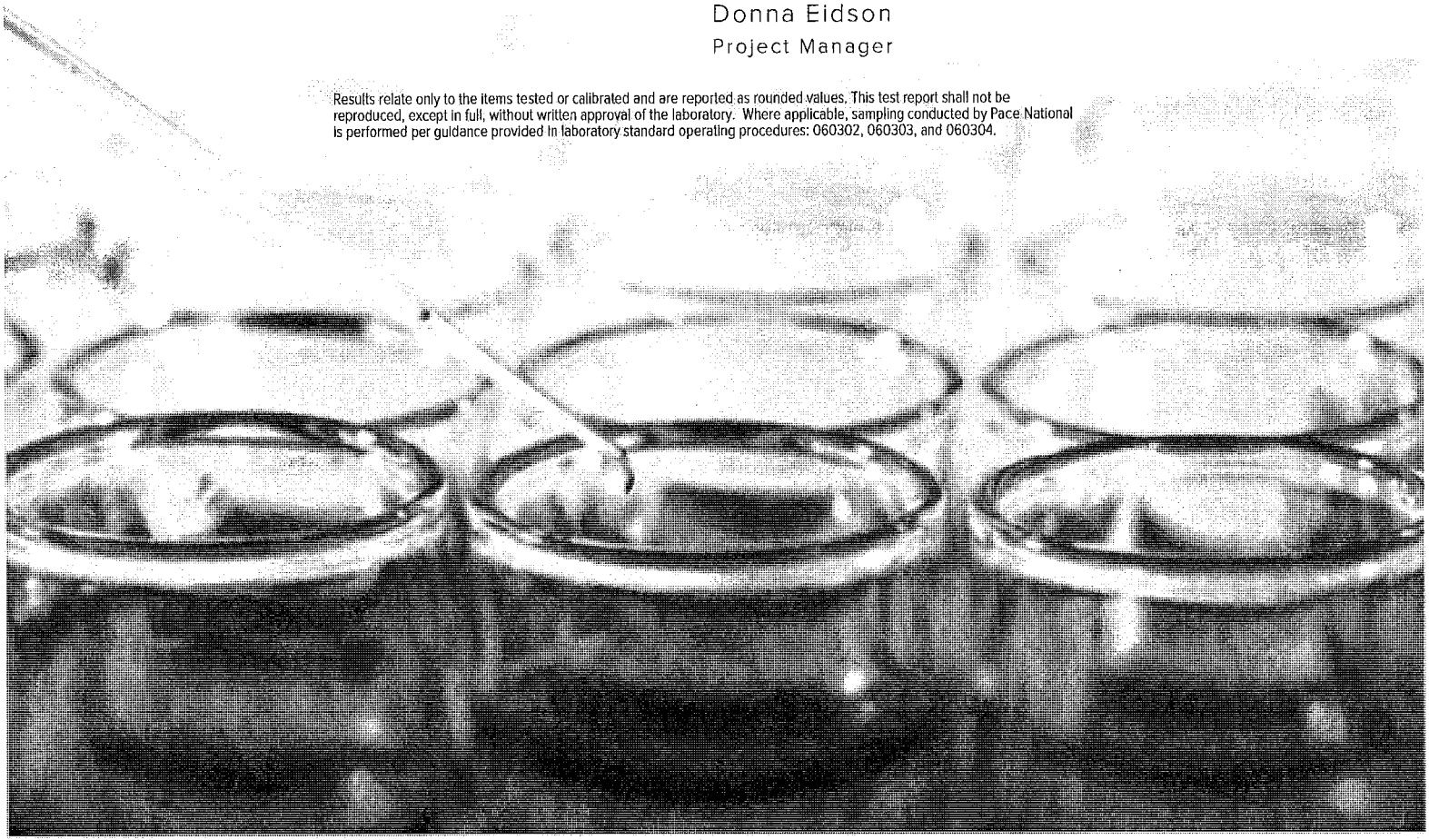
Sample Delivery Group:	L1100989
Samples Received:	05/21/2019
Project Number:	1905168
Description:	

Report To: John DuPont
2300 Double Creek Drive
Round Rock, TX 78664

Entire Report Reviewed By:

Donna Eidson
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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H-31 L1100989-01 Non-Potable Water

Collected by	Collected date/time	Received date/time
	05/14/19 07:40	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

H-32 L1100989-02 Non-Potable Water

Collected by	Collected date/time	Received date/time
	05/14/19 08:25	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

H-27 L1100989-03 Non-Potable Water

Collected by	Collected date/time	Received date/time
	05/14/19 09:40	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

H-29 L1100989-04 Non-Potable Water

Collected by	Collected date/time	Received date/time
	05/14/19 11:25	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

H-28 L1100989-05 Non-Potable Water

Collected by	Collected date/time	Received date/time
	05/14/19 12:30	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

H-26 L1100989-06 Non-Potable Water

Collected by	Collected date/time	Received date/time
	05/14/19 14:25	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

	Collected by	Collected date/time	Received date/time
H-33 L1100989-07 Non-Potable Water		05/14/19 15:30	05/21/19 10:10

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Radiochemistry by Method 904	WG1285651	1	05/24/19 09:05	05/31/19 11:10	JMR	Mt. Juliet, TN
Radiochemistry by Method Calculation	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN
Radiochemistry by Method SM7500Ra B M	WG1287234	1	05/29/19 08:27	06/03/19 17:48	RGT	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Donna Eidson
Project Manager

Radiochemistry by Method 904

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-228	0.531		0.515	0.789	05/31/2019 11:10	WG1285651
(T) Barium	*120*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*93.0*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
Combined Radium	3.15		1.09	0.978	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-226	2.62		0.578	0.189	06/03/2019 17:48	WG1287234
(T) Barium-133	*104*			*30.0-143*	*06/03/2019 17:48*	WG1287234

Radiochemistry by Method 904

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
RADIUM-228	0.147		0.380	0.546	05/31/2019 11:10	WG1285651
(T) Barium	*100*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*109*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
Combined Radium	0.450		0.625	0.833	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
RADIUM-226	0.303		0.245	0.287	06/03/2019 17:48	WG1287234
(T) Barium-133	*105*			*30.0-143*	*06/03/2019 17:48*	WG1287234

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Radiochemistry by Method 904

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
RADIUM-228	0.928		0.365	0.563	05/31/2019 11:10	WG1285651
(T) Barium	*96.7*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*98.1*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
Combined Radium	2.03		0.814	0.854	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
RADIUM-226	1.10		0.449	0.291	06/03/2019 17:48	WG1287234
(T) Barium-133	*85.4*			*30.0-143*	*06/03/2019 17:48*	WG1287234

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Radiochemistry by Method 904

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
RADIUM-228	0.352		0.428	0.707	05/31/2019 11:10	WG1285651
(T) Barium	*116*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*96.5*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
Combined Radium	0.474		0.641	1.05	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result pCi/l	Qualifier	Uncertainty +/-	MDA pCi/l	Analysis Date date / time	Batch
RADIUM-226	0.122		0.213	0.339	06/03/2019 17:48	WG1287234
(T) Barium-133	*72.2*			*30.0-143*	*06/03/2019 17:48*	WG1287234

Radiochemistry by Method 904

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-228	0.615		0.370	0.575	05/31/2019 11:10	WG1285651
(T) Barium	*106*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*95.5*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
Combined Radium	1.06		0.634	0.777	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-226	0.444		0.264	0.202	06/03/2019 17:48	WG1287234
(T) Barium-133	*90.7*			*30.0-143*	*06/03/2019 17:48*	WG1287234

Radiochemistry by Method 904

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-228	0.598		0.330	0.545	05/31/2019 11:10	WG1285651
(T) Barium	*98.4*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*113*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
Combined Radium	2.03		0.761	0.783	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-226	1.43		0.431	0.238	06/03/2019 17:48	WG1287234
(T) Barium-133	*103*			*30.0-143*	*06/03/2019 17:48*	WG1287234

Radiochemistry by Method 904

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-228	1.35		0.414	0.627	05/31/2019 11:10	WG1285651
(T) Barium	*97.4*			*62.0-143*	*05/31/2019 11:10*	WG1285651
(T) Yttrium	*96.3*			*79.0-136*	*05/31/2019 11:10*	WG1285651

Radiochemistry by Method Calculation

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
Combined Radium	2.20		0.764	0.846	06/03/2019 17:48	WG1287234

Radiochemistry by Method SM7500Ra B M

Analyte	Result	Qualifier	Uncertainty	MDA	Analysis Date	Batch
	pCi/l		+/-	pCi/l	date / time	
RADIUM-226	0.850		0.350	0.219	06/03/2019 17:48	WG1287234
(T) Barium-133	*102*			*30.0-143*	*06/03/2019 17:48*	WG1287234

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3417363-1 05/30/19 12:10

Analyte	MB Result pCi/l	MB Qualifier	MB MDA pCi/l
Radium-228	-0.0581		0.396
(T) Barium	*105*		
(T) Yttrium	*110*		

L1100977-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1100977-01 05/30/19 12:10 • (DUP) R3417363-5 05/30/19 12:10

Analyte	Original Result pCi/l	DUP Result pCi/l	Dilution	DUP RPD %	DUP RER	DUP Qualifier	DUP RPD Limits %	DUP RER Limit
Radium-228	-0.0695	0.650	1	200	0.741		20	3
(T) Barium	*109*	*111*						
(T) Yttrium	*113*	*107*						

Laboratory Control Sample (LCS)

(LCS) R3417363-2 05/30/19 12:10

Analyte	Spike Amount pCi/l	LCS Result pCi/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Radium-228	5.00	5.29	106	80.0-120	
(T) Barium			*104*		
(T) Yttrium			*114*		

L1100989-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1100989-01 05/31/19 11:10 • (MS) R3417363-3 05/30/19 12:10 • (MSD) R3417363-4 05/30/19 12:10

Analyte	Spike Amount pCi/l	Original Result pCi/l	MS Result pCi/l	MSD Result pCi/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	MS RER	RPD Limits %
Radium-228	20.0	0.531	20.9	19.5	102	94.8	1	70.0-130			7.08		20
(T) Barium		*120*			*102*	*115*							
(T) Yttrium		*93.0*			*117*	*114*							

Method Blank (MB)

(MB) R3419580-1 06/03/19 17:43

Analyte	MB Result	MB Qualifier	MB MDA
	pCi/l		pCi/l
Radium-226	0.00994		0.0573
(T) Barium-133	*67.4*		

L1103100-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1103100-01 06/03/19 17:43 • (DUP) R3419580-7 06/03/19 17:43

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP RER	DUP Qualifier	DUP RPD Limits	DUP RER Limit
	pCi/l	pCi/l		%			%	
Radium-226	0.267	1.33	1	133	2.21		20	3
(T) Barium-133	*110*	*102*						

Laboratory Control Sample (LCS)

(LCS) R3419580-2 06/03/19 17:43

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	pCi/l	pCi/l	%	%	
Radium-226	5.02	5.10	102	80.0-120	
(T) Barium-133			*56.0*		

L1101875-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1101875-03 06/03/19 17:43 • (MS) R3419580-3 06/03/19 17:43 • (MSD) R3419580-6 06/03/19 17:43

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	MS RER	RPD Limits
	pCi/l	pCi/l	pCi/l	pCi/l	%	%		%			%		%
Radium-226	20.1	0.637	17.9	20.3	86.0	97.8	1	75.0-125			12.4		20
(T) Barium-133		*83.3*			*53.7*	*71.3*							

L1101881-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1101881-03 06/03/19 17:43 • (MS) R3419580-4 06/03/19 17:43 • (MSD) R3419580-5 06/03/19 17:43

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	MS RER	RPD Limits
	pCi/l	pCi/l	pCi/l	pCi/l	%	%		%			%		%
Radium-226	20.1	0.522	21.1	19.2	102	93.1	1	75.0-125			9.23		20
(T) Barium-133		*105*			*89.6*	*99.7*							

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDA	Minimum Detectable Activity.
Rec.	Recovery.
RER	Replicate Error Ratio.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(T)	Tracer - A radioisotope of known concentration added to a solution of chemically equivalent radioisotopes at a known concentration to assist in monitoring the yield of the chemical separation.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

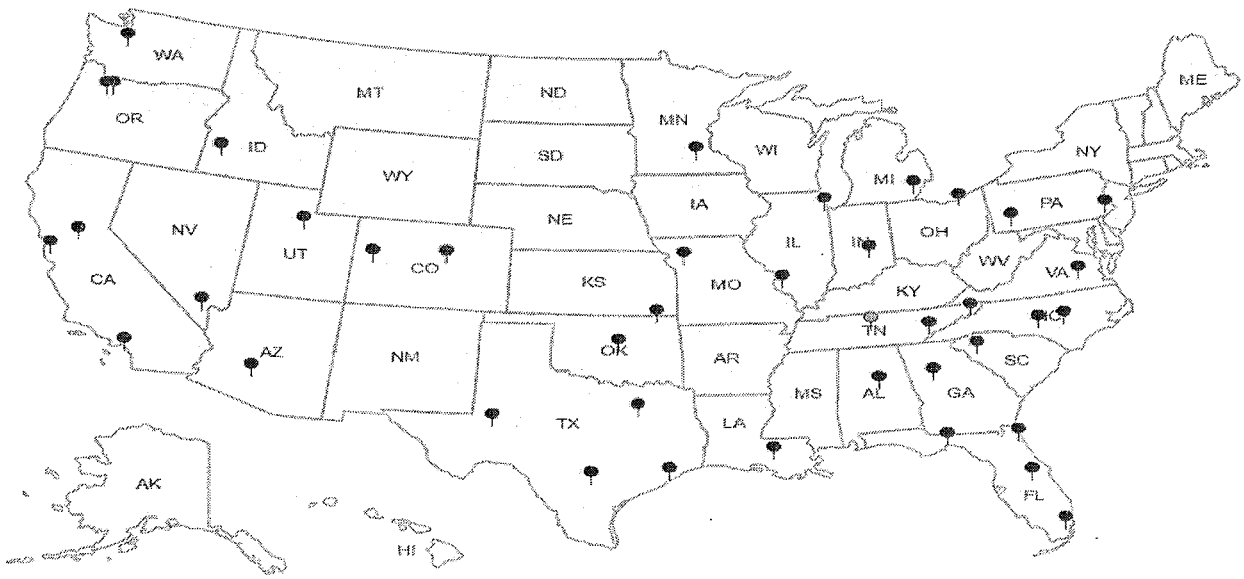
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



Pace Analytical National Center for Testing & Innovation
Cooler Receipt Form

Client: DHLRTX	SDG#:	1100989
Cooler Received/Opened On: 5/21/19	Temperature:	Amb
Received By: Brock Fariss		
Signature: Brock Fariss		

Receipt Check List	NP	Yes	No
COC Seal Present / Intact?	✓		
COC Signed / Accurate?		✓	
Bottles arrive intact?		✓	
Correct bottles used?		✓	
Sufficient volume sent?		✓	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?		✓	

Kelsey Stephenson

Login #: L1100989	Client:DHLRRTX	Date:05/21	Evaluated by:Kelsey S

Non-Conformance (check applicable items)

	Sample Integrity		Chain of Custody Clarification		
	Parameter(s) past holding time		Login Clarification Needed		**If Broken Container:**
	Temperature not in range		Chain of custody is incomplete		Insufficient packing material around container
	Improper container type		Please specify Metals requested.		Insufficient packing material inside cooler
x	pH not in range.		Please specify TCLP requested.		Improper handling by carrier (FedEx / UPS / Courie
	Insufficient sample volume.		Received additional samples not listed on coc.		Sample was frozen
	Sample is biphasic.		Sample ids on containers do not match ids on coc		Container lid not intact
	Vials received with headspace.		Trip Blank not received.		**If no Chain of Custody:**
	Broken container		Client did not "X" analysis.		Received by:
	Broken container:		Chain of Custody is missing		Date/Time:
	Sufficient sample remains				Temp./Cont. Rec./pH:
					Carrier:
					Tracking#

Login Comments: 1 of 2 H-32 was received with a pH of 6. pH adj in login 1511 5/21

Client informed by:		Call		Email		Voice Mail		Date:	Time:
TSR Initials:	Client Contact:								

Login Instructions:

Noted 5/21/19 1547

1100989

CHAIN-OF-CUSTODY RECORD

DHL Analytical, Inc.
2300 Double Creek Drive
Round Rock, TX 78664
TEL: *(512) 388-8222* FAX: *(512) 388-8229*

H007

Work Order: 1905168

Subcontractor:
Pace Analytical
12065 Lebanon Rd
Mt. Juliet, TN 37122

TEL: (615) 773-5923
FAX:
Acct #: DHLRRTX

15-May-19

Sample Id	Matrix	DHL#	Date Collected	Bottle Type	Ra-228 E904.0	Ra-226 M7500 Ra B M	Requested Tests			
					≤2	≤2				
H-31	Aqueous	-01D	05/14/19 07:40 AM	1LHDPEHNO3		1				01
H-31	Aqueous	-01E	05/14/19 07:40 AM	1LHDPEHNO3	1					1
H-32	Aqueous	-02D	05/14/19 08:25 AM	1LHDPEHNO3		1				02
H-32	Aqueous	-02E	05/14/19 08:25 AM	1LHDPEHNO3	1					1
H-27	Aqueous	-03D	05/14/19 09:40 AM	1LHDPEHNO3		1				03
H-27	Aqueous	-03E	05/14/19 09:40 AM	1LHDPEHNO3	1					1
H-29	Aqueous	-04D	05/14/19 11:25 AM	1LHDPEHNO3		1				04
H-29	Aqueous	-04E	05/14/19 11:25 AM	1LHDPEHNO3	1					1
H-28	Aqueous	-05D	05/14/19 12:30 PM	1LHDPEHNO3		1				05
H-28	Aqueous	-05E	05/14/19 12:30 PM	1LHDPEHNO3	1					1
H-26	Aqueous	-06D	05/14/19 02:25 PM	1LHDPEHNO3		1				06
H-26	Aqueous	-06E	05/14/19 02:25 PM	1LHDPEHNO3	1					1
H-33	Aqueous	-07D	05/14/19 03:30 PM	1LHDPEHNO3		1				07
H-33	Aqueous	-07E	05/14/19 03:30 PM	1LHDPEHNO3	1					

General Comments:
Please analyze these samples with Normal Turnaround Time.
Report RA-226, Ra-228 & Combined per Specs.
Quality Control Package Needed: Standard - NELAC Rad Test compliant
Email to cac@dhlanalytical.com & dupont@dhlanalytical.com

UPS
Rec: 14

	Date/Time		Date/Time
Relinquished by:	5/17/19 1700	Received by:	5/21/19 1010
Relinquished by:		Received by:	

pH adj @ 1511 RAD SCREEN: <0.5 mR/hr

golder.com