



2023 Annual Groundwater Monitoring and Corrective Action Report

Scrubber Ponds

*Lewis & Clark Station
Sidney, Montana*

Prepared for
Montana Dakota Utilities

January 2024

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Acronyms

Acronym	Description
ACM	Assessment of Corrective Measure
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
FGD	Flue-Gas Desulfurization
GWPS	Groundwater Protection Standard
MCL	Maximum Contaminant Level
MDU	Montana Dakota Utilities Company
RICE	Reciprocating Internal Combustion Engine
RL	Reporting Limit
RSL	Regional Screening Level
SSI	Statistically Significant Increase
TSP	Temporary Storage Pad

Executive Summary

This summary provides an overview of the Groundwater Monitoring & Corrective Action Program status as required by 40 CFR 257.94(e)(6). The Site operated under the assessment monitoring program described in § 257.95 at the start of the 2023 annual reporting period through spring 2023. Lithium was detected at statistically significant levels above the groundwater protection standards (GWPS) for the spring semiannual monitoring event at all downgradient monitoring wells. An alternative source demonstration showed that the elevated lithium levels resulted from a source other than the CCR unit for the fall 2022 and spring 2023 monitoring events.

The CCR unit was decommissioned by removal of CCR in 2022, and the site was regraded to establish positive drainage and minimize infiltration. Decommissioning construction was complete October 24, 2022. The coal-fired generating plant was demolished, leaving only gas-fired reciprocating internal combustion engine (RICE) generation at the site. Assessment monitoring continued through spring 2023 until it was demonstrated that closure by removal requirements (§ 257.102(c) Closure by removal of CCR) were met, at which time assessment monitoring was terminated. No remedial activities were initiated in 2023.

Closure of the Scrubber Ponds was certified by a Qualified Professional Engineer on December 18, 2023, based on the results of the fall 2022 and spring 2023 monitoring results, both events conducted after closure construction was completed. Since the site has been closed under § 257.102(c) Closure by Removal of CCR, groundwater quality monitoring is no longer required under the rule and groundwater quality monitoring is not being done at this time. This is the last Groundwater Monitoring & Corrective Action Report to be prepared for the Lewis & Clark Station CCR units under the current CCR Rule.

1 Introduction

Montana-Dakota Utilities Co. (MDU) owns and operates Lewis & Clark Station near Sidney, Montana (Figure 1). The coal-fired electrical generation unit was retired in 2021 and demolished by mid-2022. A gas-fired reciprocating internal combustion engine (RICE) generation unit continues to operate on the property. Coal combustion residuals (CCR) were managed in two storage ponds at the property and regulated by the US Environmental Protection Agency (EPA) CCR Rule (40 CFR Parts 257 and 261, Disposal of Coal Combustion Residuals from Electric Utilities), referred to herein as the CCR Rule. The storage ponds—which comprised a single, multi-unit CCR surface impoundment under the CCR Rule—were named the East and West Scrubber Ponds, or collectively the Scrubber Ponds.

The Scrubber Ponds stored sluiced flue-gas desulfurization (FGD) solids. A Temporary Storage Pad (TSP) received material from the Scrubber Ponds for conditioning before disposal. Monitoring and reporting requirements in the CCR Rule did not apply to the decommissioned TSP because it qualified for the CCR pile exemptions in the CCR Rule while it was still in place. The former TSP, which was located in the same location as the current TSP, is closed.

The coal-fired Lewis & Clark generating plant was retired on March 31, 2021. Decommissioning and demolition of the plant and supporting facilities were substantially completed October 24, 2022. CCR solids and impacted liquids removal from the CCR unit was complete June 24, 2022. Regrading of the Scrubber Ponds area was completed September 19, 2022.

The locations of the former Scrubber Ponds and TSP are shown on Figure 1. This 2023 Annual Groundwater Monitoring and Corrective Action Report (Annual Report) describes the groundwater monitoring program and results for the Scrubber Ponds at MDU's Lewis & Clark Station.

1.1 Purpose

As stated in Section § 257.90(e), the purpose of the Annual Report is to:

- Document the status of monitoring and corrective action program for the CCR unit
- Summarize key actions completed
- Describe any problems encountered
- Discuss actions to resolve the problems
- Project key activities for the upcoming year

1.2 Status of the Groundwater Monitoring and Corrective Action Program

The Scrubber Ponds were in assessment monitoring until the spring 2023 monitoring results were received and analyzed, and a certification of closure was completed on December 18, 2023. Baseline groundwater monitoring was completed in 2017, as documented in the 2017 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area (Barr, 2018a). Statistical evaluation of detection monitoring program results began on October 17, 2017, and continued

until April 14, 2018 (Barr, 2019a). A statistically significant increase (SSI) over background levels was determined for constituents listed in appendix III to the CCR Rule in 2018, so the site transitioned to an assessment monitoring program (§ 257.95(a)) on April 15, 2018. Assessment monitoring continued through spring 2023, after which time the CCR unit was closed under the provisions of § 257.102(c) Closure by Removal of CCR.

It was determined on January 2, 2019, that the initial assessment monitoring event resulted in detections of lithium and selenium at statistically significant levels above applicable groundwater protection standards (GWPS). An assessment of corrective measures (ACM) was initiated on April 2, 2019, and completed on August 29, 2019 (Barr, 2019b). Selection of remedy, as described in § 257.97, was initiated after completion of the ACM, subject to the ongoing evaluation of a potential alternative source. An ASD showing that lithium and selenium levels above GWPS are attributable to a source other than the CCR unit was completed on January 28, 2021 (Barr, 2021), and the selection of remedy was terminated. The Site returned to assessment monitoring after termination of the selection of remedy.

1.3 CCR Rule Requirements

This Annual Report has been prepared in accordance with the requirements of § 257.90(e) of the CCR Rule, as outlined in Table 1.

2 Groundwater Monitoring and Corrective Action Program

This section documents the status of the groundwater monitoring and corrective action program for the CCR unit for 2023. The groundwater monitoring system is described in Section 2.1, monitoring and analytical results are described in Section 2.2, the corrective action program status is described in Section 2.3, key actions completed and problems encountered are described in Section 2.4, and key activities planned for 2024 are described in Section 2.5.

2.1 Groundwater Monitoring System

2.1.1 Documentation

Figure 1 is an aerial image of the CCR unit and all upgradient (or background) and downgradient monitoring wells in the groundwater monitoring system, including well identification numbers, that are part of the groundwater monitoring program, as required by § 257.90(e)(1). The coal-fired plant, Scrubber Ponds, and the TSP were removed and the site regraded in 2022, so the aerial imagery no longer represents current conditions. Further details on the groundwater monitoring system are included in Groundwater Monitoring System Certification, Lewis & Clark Station (Barr, 2018b).

2.1.2 Changes to Monitoring System

The Scrubber Ponds were closed in accordance with the requirements of CCR Rule § 257.102(c) following the completion of an alternative source demonstration for lithium for the spring 2023 monitoring results (Barr, 2023). There were no changes to the monitoring system in 2023.

2.2 Monitoring and Analytical Results

The background concentrations, GWPS, groundwater sampling activities, and analytical results are described in the following sections.

2.2.1 Appendix III Background Concentration Levels

Background concentration levels established in accordance with § 257.94(b) are presented in Table 2 in compliance with § 257.95(d)(3).

2.2.2 Appendix IV Groundwater Protection Standards (GWPS)

In compliance with CCR Rule § 257.95(d)(2), GWPS were established for all appendix IV constituents detected in groundwater. GWPS are defined as the highest of the following values: the applicable maximum contaminant level (MCL); or, in the case of cobalt, lead, lithium and molybdenum, the default GWPS values established under the CCR Rule; or, for any constituent, a site-specific background concentration established from background sampling. Background levels of lithium and selenium at the site were demonstrated to be higher than the default GWPS and MCL, respectively. Thus, site-specific GWPS were determined in accordance with the statistical methods established in § 257.93(f-g) and the Statistical Method Selection Certification (Barr, 2017) using the monitoring results from samples collected

from upgradient/background monitoring wells. The background concentrations for other appendix IV parameters are lower than the default GWPS or MCL for each parameter. The site-specific GWPS values are presented in Table 3.

Lithium groundwater monitoring results for upgradient samples (from monitoring wells MW-103, MW-110, and MW-119) collected during the baseline period defined by the CCR Rule (ending in October 2017) were reported as non-detect with a reporting limit (RL) of 100 µg/L; therefore, the initial background lithium concentration level was set as the RL of 100 µg/L for lithium. On July 30, 2018, EPA promulgated for the first time a default GWPS (40 µg/L) for lithium in the agency's Phase I revision to CCR Rule § 257.95(h)(2).

After the Phase I CCR Rule revision was published, all wells in the groundwater monitoring system were sampled and analyzed three times for lithium concentrations with a lower RL of 40 µg/L. A lithium GWPS was determined in 2018 using the upgradient lithium monitoring results from the three events that used the lower RL (a total of nine samples; Barr, 2020). Five additional samples from each well were analyzed for lithium in 2019 and 2020. With eight baseline events (the minimum number specified for baseline monitoring in § 257.94(b)) at the lower RL, the lithium GWPS was recalculated in 2020 (Barr, 2021). The lithium GWPS was again recalculated in March 2021 to match the update schedule for other parameters, as described in the 2021 annual report (Barr, 2022).

2.2.3 Monitoring Actions and Results

The following actions and results occurred during assessment monitoring in 2023:

- A total of seven samples (seven monitoring wells during one sampling event) were collected from the CCR groundwater monitoring system. Samples were analyzed for the constituents listed in appendices III and IV (Part 257). The assessment monitoring sampling event (April 24, 2023) was consistent with the requirements of § 257.95(b) and § 257.95(d)(1).
- The monitoring results for the event were statistically analyzed to determine if any constituent was detected at statistically significant levels above the GWPS.
- Lithium was detected at statistically significant levels above the GWPS for the spring 2023 monitoring event at all downgradient monitoring wells.

Sampling dates are reported on the field data sheets and analytical laboratory reports in Appendix A. A summary of the analytical results and measured groundwater elevations is provided in Table 4.

Statistical analyses were conducted for each monitoring event to evaluate analytical results against background concentrations and the GWPS, as required by § 257.93(f) through § 257.93(h). Statistical analysis was conducted in accordance with the Statistical Method Selection Certification as amended in the ASD that was attached to the 2020 Annual Groundwater Monitoring and Corrective Action Report (Barr, 2021). Results of the statistical analyses for the spring 2023 event are presented in Table 5.

2.2.4 Groundwater Flow

Groundwater is generally encountered at 5 to 15 feet below ground surface (Table 4). The groundwater flows generally from west to east across the Site, then radially outward to the north and north-northeast

toward Richland County Irrigation Ditch #12 and the east toward the Yellowstone River. Groundwater flow direction and rate were evaluated for the spring 2023 event. Groundwater level contour maps showing flow direction are included as Figure 2 for spring 2023. Groundwater flow rate calculation results are provided in Appendix C.

2.3 Corrective Action Program Status

An assessment of corrective measures (ACM) was initiated on April 2, 2019, as required by § 257.95(g)(4) after an alternative source demonstration (ASD) could not be prepared within the time allowed by the CCR Rule. The ACM was completed on August 29, 2019 (Barr, 2019b). After completion of the ACM, the corrective action program entered the selection of remedy phase (§ 257.97).

An alternative source demonstration (ASD) was completed for lithium and selenium and published with the 2020 groundwater monitoring and corrective action report. The results of the ASD demonstrated that a source other than the CCR unit caused lithium and selenium levels above GWPS (Barr, 2021). Therefore, the selection of remedy phase was terminated, and the site is not in corrective action.

2.4 Key Actions Completed/Problems Encountered

The following key actions were completed for the groundwater monitoring program in 2023:

- Completed semiannual assessment monitoring sampling for each background and downgradient well.
- Determined that lithium was detected at statistically significant levels above background at all downgradient wells during the spring 2023 monitoring event.
- Completed an ASD for lithium for the fall 2022 and spring 2023 monitoring events (Appendix B)
- Determined the monitoring and ASD results supported closure of the CCR unit under § 257.102(c), Closure by removal of CCR.

No problems were encountered.

The CCR unit was decommissioned by removal of CCR in 2022, and the site was regraded to establish positive drainage and minimize infiltration. Closure construction for the CCR unit was completed October 4, 2022.

2.5 Key Activities for Upcoming Year

The CCR unit is considered closed under § 257.102(c), Closure by removal of CCR. No further groundwater monitoring program activities are planned.

3 References

- Barr, 2023. Lewis & Clark Station Scrubber Ponds, Notification of Closure, Prepared for Montana Dakota Utilities Company. December 2023.
- Barr, 2022. 2021 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities Company. January 2022.
- Barr, 2021. 2020 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities Company. January 2021.
- Barr, 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities Company. January 2020.
- Barr, 2019a. 2018 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities Company. January 2019.
- Barr, 2019b. Assessment of Corrective Measures, Lewis & Clark Station. Prepared for Montana Dakota Utilities Company. August 2019.
- Barr, 2018a. 2017 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities Company. January 2018.
- Barr, 2018b. Groundwater Monitoring System Certification. Prepared for Montana Dakota Utilities Company. November 2018.
- Barr, 2017. Statistical Method Selection Certification. Prepared for Montana Dakota Utilities Company. October 2017.

Tables

Table 1
CCR Rule Requirements
Lewis & Clark Station; Sidney, Montana

CCR Rule Reference	Content Required in Report	Location
§ 257.90(e)(1)	Map showing the CCR unit and all monitoring wells that are part of the groundwater monitoring system	Section 2.1.1 Documentation; see Figure 1
§ 257.90(e)(2)	Discuss any new or decommissioned monitoring wells	Section 2.1.2 Changes to Monitoring System
§ 257.90(e)(3)	Provide the number and date groundwater samples were collected, and the monitoring data (i.e., detection or assessment)	Section 2.2 Monitoring and Analytical Results
§ 257.90(e)(4)	Discuss any transition between monitoring programs	Not applicable in 2023
§ 257.90(e)(5)	Other information specified in § 257.90 through § 257.98	See § 257.95(d)(3) and § 257.95(a) in this Table
§ 257.90(e)(6)	Overview of the current status of groundwater monitoring and corrective action programs	Executive Summary
§ 257.95(d)(3)	Assessment monitoring concentrations, background concentrations, and groundwater protection standards	Table 2, Section 2.2.2 Appendix IV Groundwater Protection Standards, Table 3 through Table 5, and Appendix A
§ 257.95(g)(3)(ii)	Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.	Appendix B

Table 2
Background Concentration Levels (Appendix III)
Lewis & Clark Station; Sidney, Montana

Parameter	Units	Background Concentration Level
Boron	mg/L	2.4
Calcium	mg/L	105
Chloride	mg/L	27
Fluoride	mg/L	0.87
pH	pH units	7.2 – 7.5
Sulfate	mg/L	516
Total Dissolved Solids	mg/L	1,080

Background concentration level based on statistical methods established in 40 CFR 257.93 (f-g).
Background concentration levels may exhibit slight variability among monitoring event
evaluations due to corrections for seasonal variability as required by 40 CFR 257.93(g)(6).

Table 3
 Groundwater Protection Standards (Appendix IV)
 Lewis & Clark Station; Sidney, Montana

Parameter	Units	Groundwater Protection Standard	MCL or RSL	Background Concentration Level
Antimony	µg/L	6	6	5.7
Arsenic	µg/L	10	10	3.4
Barium	µg/L	2000	2000	40.2
Beryllium	µg/L	4	4	0.5
Cadmium	µg/L	5	5	0.9
Chromium	µg/L	100	100	2.3
Cobalt	µg/L	6	6	2.7
Fluoride	mg/L	4	4	0.87
Lead	µg/L	15	15	0.7
Lithium	µg/L	63.1	40	63.1
Mercury	µg/L	2	2	0.2
Molybdenum	µg/L	100	100	29.2
Selenium	µg/L	70.5	50	70.5
Thallium	µg/L	2	2	0.5
Radium, combined (226+228)	pCi/L	5	5	2.5

MCL: Maximum Contaminant Level, as established in 40 CFR 141.62 and 141.66.

RSL: Regional Screening Level (default GWPS), as included in the Phase I revision to 40 CFR 259.95(h) issued on July 30, 2018.

Background concentration level based on statistical methods established in 40 CFR 257.93 (f-g).

Table 4
Groundwater Analytical Data Summary
Lewis & Clark
Montana-Dakota Utilities Company

Location			MW103		MW110	MW111	MW117	MW118	MW119	MW120	MW121	QC
Date			4/24/2023		4/24/2023	4/25/2023	4/24/2023	4/25/2023	4/24/2023	4/24/2023	4/25/2023	4/25/2023
Sample Type			N	FD	N	N	N	N	N	N	N	FB
Parameter	Analysis Location	Units										
Appendix III												
Boron, Total	Lab	mg/l	< 1 U	< 1 U	0.22	8.01	7.53	1.42	0.22	10.0	6.71	< 0.1 U
Calcium, Total	Lab	mg/l	93.2	94.3	92.4	182	322	101	91.2	458	102	< 1 U
Chloride	Lab	mg/l	24.3	24.3	38.6	40.6	41.5	27.2	36.8	64.6	17.7	< 2.0 U
Fluoride	Lab	mg/l	0.65	0.62	0.46	1.98	0.19	0.85	0.42	0.41	2.61	< 0.1 U
pH	Field	pH units	7.67	--	7.75	7.52	7.52	7.75	7.65	6.95	7.44	--
Solids, total dissolved	Lab	mg/l	912	914	719	3760	7040	1260	698	7130	1610	< 10 U
Sulfate, as SO4	Lab	mg/l	332	356	184	2060	4580	579	178	4060	738	< 5 U
Appendix IV												
Antimony, Total	Lab	mg/l	0.0068	0.0059	< 0.001 U	< 0.001 U	< 0.001 U	< 0.001 U	< 0.001 U	< 0.001 U	< 0.001 U	< 0.001 U
Arsenic, Total	Lab	mg/l	0.0043	0.0033	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Barium, Total	Lab	mg/l	0.0514	0.0502	0.0396	0.0205	0.0130	0.0234	0.0296	0.0154	0.0330	< 0.002 U
Beryllium, Total	Lab	mg/l	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U
Cadmium, Total	Lab	mg/l	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U
Chromium, Total	Lab	mg/l	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	0.0032	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Cobalt, Total	Lab	mg/l	0.0109	0.0110	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Lead, Total	Lab	mg/l	0.0007	0.0007	0.0008	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U
Lithium, Total	Lab	mg/l	0.0430	0.0447	0.0329	0.158	0.107	0.0648	0.0333	0.109	0.119	< 0.02 U
Mercury, Total	Lab	mg/l	< 0.0002 U	0.0003	< 0.0002 U	< 0.0002 U	< 0.0002 U	< 0.0002 U	< 0.0002 U	< 0.0002 U	< 0.0002 U	< 0.0002 U
Molybdenum, Total	Lab	mg/l	0.0201	0.0209	0.0030	0.0546	0.0032	0.0233	0.0035	0.0020	0.0627	< 0.002 U
Selenium, Total	Lab	mg/l	0.0404	0.0328	< 0.005 U	0.0777	0.0320	0.0637	< 0.005 U	< 0.005 U	0.0162	< 0.005 U
Thallium, Total	Lab	mg/l	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U	< 0.0005 U
Radium 226	Lab	pCi/l	0.2 +/- 0.2 ND	0.2 +/- 0.2 ND	0.03 +/- 0.04 ND	0.09 +/- 0.1 ND	0.4 +/- 0.2	-0.08 +/- 0.1 ND	0.004 +/- 0.04 ND	-0.02 +/- 0.1 ND	--	-0.03 +/- 0.1 ND
Radium 228	Lab	pCi/l	0.04 +/- 0.8 ND	0.2 +/- 0.9 ND	-0.6 +/- 0.8 ND	0.08 +/- 0.7 ND	1.2 +/- 0.6	0.2 +/- 0.9 ND	-0.6 +/- 0.8 ND	-0.2 +/- 0.8 ND	--	0.4 +/- 0.9 ND
Radium, combined (226+228) [Barr Calculation]	Lab	pCi/l	0.2 +/- 0.8 ND	0.4 +/- 1.0 ND	0.03 +/- 0.04 ND	0.17 +/- 0.7 ND	1.6 +/- 0.6	0.2 +/- 0.9 ND	0.004 +/- 0.04 ND	ND	--	0.4 +/- 0.9 ND
Water Levels												
Depth to water	Field	ft	10.39	--	8.91	7.49	5	8.15	8.74	14.81	12.49	--
Elevation	Calc.	ft amsl	1916.94	--	1917.39	1915.71	1915.34	1915.96	1917.54	1910.41	1892.1	--

-- Not analyzed/Not available.
N Sample Type: Normal.
FD Sample Type: Field Duplicate.
FB Sample Type: Field Blank.
U The analyte was analyzed for, but was not detected.
ND Not detected. Radium result was below uncertainty

Table 5
Summary of Statistical Results
April 2023 Assessment Monitoring
Lewis Clark Station

	Parameter	Units	GWPS	PL/TL	Analysis Type	MW111	MW117	MW118	MW120
Appendix III Constituents	Boron	mg/L	n/a	2.4	NP PL (d)	8.78	8.3	2.19	10.70
	Calcium	mg/L	n/a	105	P PL	182	322	101	458
	Chloride	mg/L	n/a	27	P PL	40.6	41.5	27.2	64.6
	Fluoride	mg/L	n/a	0.87	NP PL	1.98	0.19	0.85	0.41
	pH	units	n/a	7.0 - 7.5	NP PL (d)	7.46	7.46	7.69	6.89
	Sulfate	mg/L	n/a	516	NP PL	2060	4580	579	4060
	TDS	mg/L	n/a	1080	NP PL	3760	7040	1260	7130
Appendix IV Constituents	Antimony	µg/L	6	5.7	NP TL	< 1	< 1	< 1	< 1
	Arsenic	µg/L	10	3.4	NP TL	< 2	< 2	< 2	< 2
	Barium	µg/L	2000	40.2	P TL	20.5	13.0	23.4	15.4
	Beryllium	µg/L	4	0.5	NP TL	< 0.5	< 0.5	< 0.5	< 0.5
	Cadmium	µg/L	5	0.9	NP TL	< 0.5	< 0.5	< 0.5	< 0.5
	Chromium	µg/L	100	2.3	NP TL	< 2	3.2	< 2	< 2
	Cobalt	µg/L	6	2.7	NP TL	< 2	< 2	< 2	< 2
	Fluoride	mg/L	4	0.87	P TL	1.98	0.19	0.85	0.41
	Lead	µg/L	15	0.7	NP TL	< 0.5	< 0.5	< 0.5	< 0.5
	Lithium	µg/L	63.1	63.1	P TL	158	107	64.8	109
	Mercury	µg/L	2	0.2	NP TL	< 0.2	< 0.2	< 0.2	< 0.2
	Molybdenum	µg/L	100	29.2	P TL	54.6	3.20	23.3	2.00
	Selenium*	µg/L	70.5	70.5	Trend, NP TL	77.7	32.0	63.7	5
	Thallium	µg/L	2	0.5	NP TL	< 0.5	< 0.5	< 0.5	< 0.5
Radium 226+228	pCi/L	5	2.5	NP TL	< 0.17	1.6	< 0.2	n/a	

Notes

-Pink: Sample was a statistically significant increase over upgradient background (Appx III to 40 CFR 257) or GWPS (Appx IV).

-Green: Sample was not a statistically significant increase over upgradient background (Appx III) or GWPS (Appx IV).

-pH: two-sided prediction limit; color indicates sample higher or lower than prediction limits.

-Parametric (P) interwell prediction limits (PL, Appx III) or tolerance limits (TL, Appx IV) used if background data satisfied normality test. If not, non-parametric (NP) prediction/tolerance limits of highest background value used.

-Upgradient (background) wells: MW119, MW110, MW103; data through March 2021.

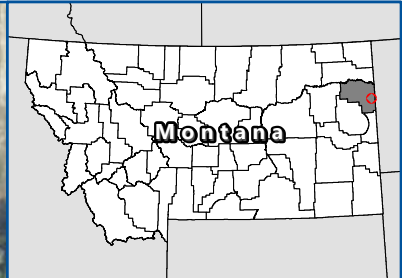
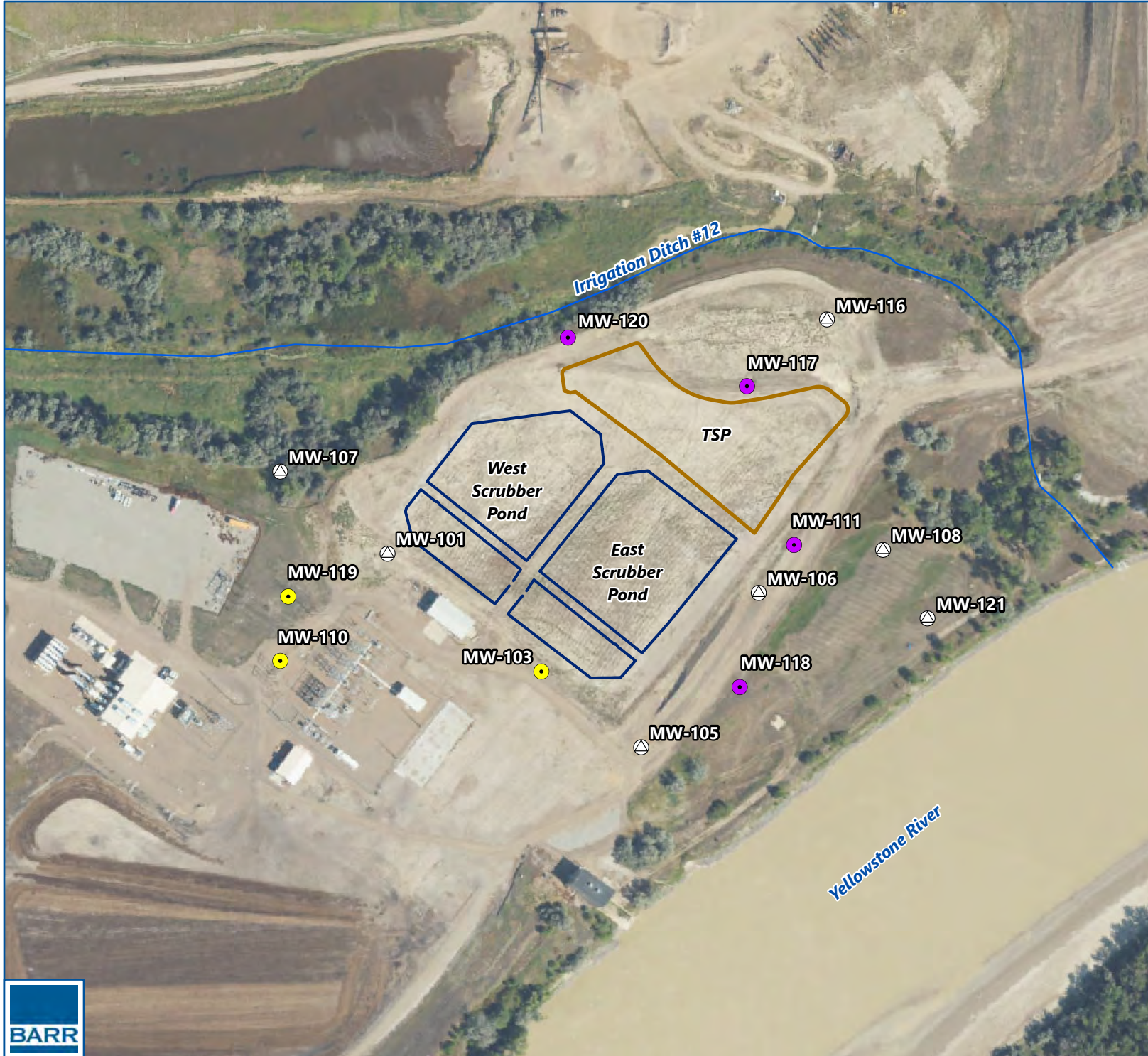
-GWPS comparison used lower confidence limits (LCLs) of the mean, median, or trend line.






n/a: both radium 226 and radium 228 had negative non-detect results

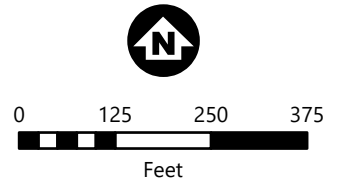
-Boron and pH data were deseasonalized (d). Adjustments may result in additional SSIs.

*Selenium SSIs evaluated by linear trend analysis due to significantly trending data (MW111, MW117, MW118). The lower confidence limit of a linear trend line is compared to the GW protection standard.

Figures



-  Upgradient Monitoring Well
-  Downgradient Monitoring Well
-  Water Level Monitoring Well
-  Scrubber Pond
-  Temporary Storage Pad (TSP)

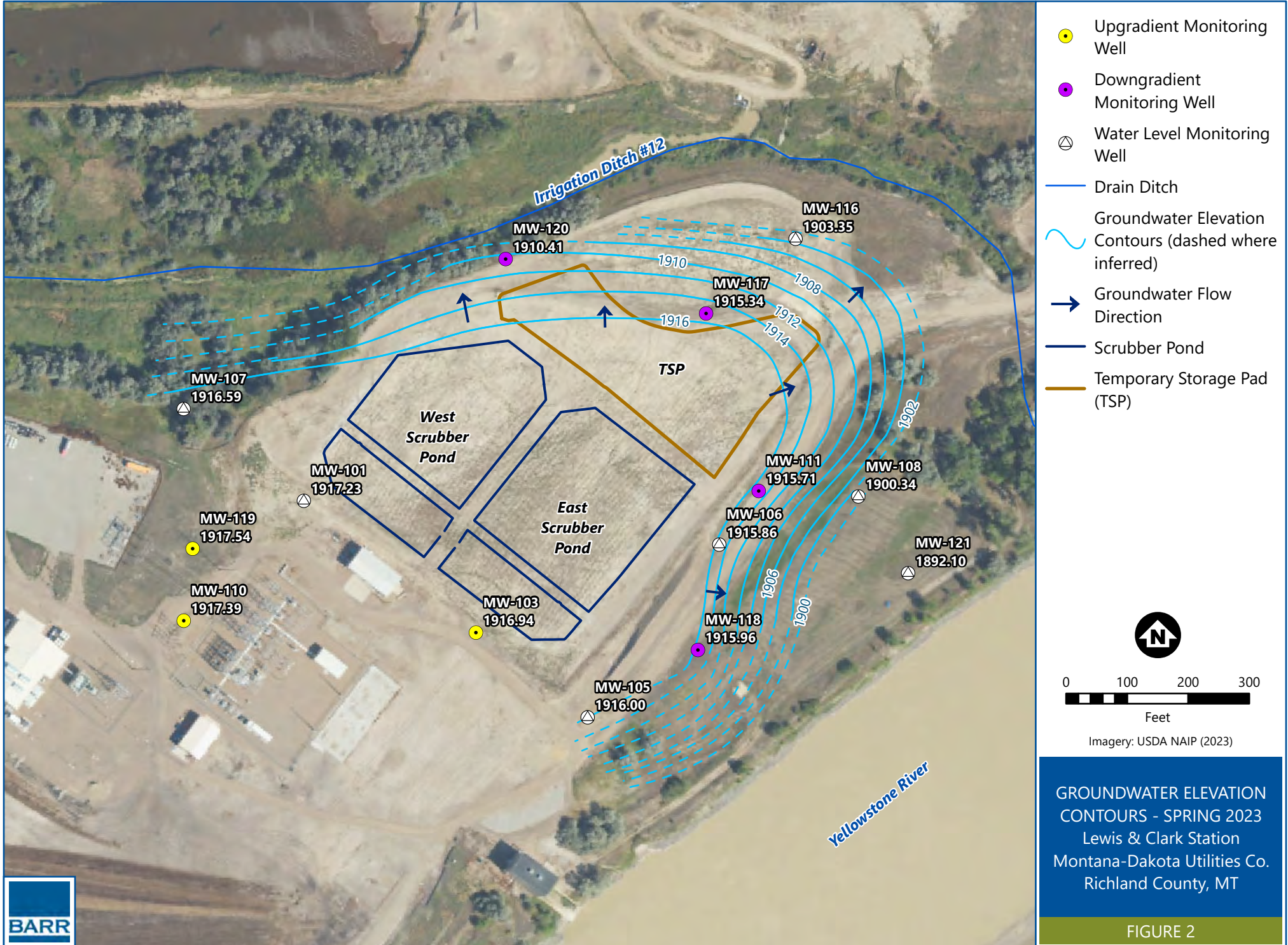


Imagery: USDA NAIP (2023)

GROUNDWATER MONITORING SYSTEM
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT

FIGURE 1





GROUNDWATER ELEVATION
CONTOURS - SPRING 2023
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT

FIGURE 2



Appendices

Appendix A

Laboratory Reports and Field Sheets



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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www.MVTL.com



Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Workorder Summary

Workorder Comments

All analytes with dilution factors greater than 1 (displayed in DF column) required dilution due to matrix or high concentration of target analyte unless otherwise noted and reporting limits (RDL column) have been adjusted accordingly.

Analysis Results Comments

13561001 (MW103)

Sample analyzed beyond holding time.(pH)

13561002 (MW110)

Sample analyzed beyond holding time.(pH)

13561003 (MW119)

Sample analyzed beyond holding time.(pH)

13561004 (MW111)

Sample analyzed beyond holding time.(pH)

13561005 (MW117)

Sample analyzed beyond holding time.(pH)

13561006 (MW118)

Sample analyzed beyond holding time.(pH)

13561007 (MW120)

Sample analyzed beyond holding time.(pH)

13561008 (Dup 1)

Sample analyzed beyond holding time.(pH)

13561009 (Field Blank (FB))

Sample analyzed beyond holding time.(pH)

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561001 **Date Collected:** 04/24/2023 14:52 **Matrix:** Groundwater
Sample ID: MW103 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	1225	umhos/cm	1	1	04/24/2023 14:52	04/24/2023 14:52	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	7.67	units	0.01	1	04/24/2023 14:52	04/24/2023 14:52	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	8.78	degrees C		1	04/24/2023 14:52	04/24/2023 14:52	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	332	mg/L	25	5	04/27/2023 10:49	04/27/2023 10:49	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	<1	mg/L	1	10	04/26/2023 18:02	04/28/2023 16:49	SLZ	
Calcium	93.2	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:43	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	7.9	units	0.1	1	04/26/2023 22:19	04/26/2023 22:19	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	24.3	mg/L	2.0	1	04/28/2023 10:27	04/28/2023 10:27	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.65	mg/L	0.1	1	04/26/2023 22:19	04/26/2023 22:19	RAA	

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www.MVTL.com



Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561001 **Date Collected:** 04/24/2023 14:52 **Matrix:** Groundwater
Sample ID: MW103 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	912	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561002 **Date Collected:** 04/24/2023 09:25 **Matrix:** Groundwater
Sample ID: MW110 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	1065	umhos/cm	1	1	04/24/2023 09:25	04/24/2023 09:25	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	7.75	units	0.01	1	04/24/2023 09:25	04/24/2023 09:25	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	7.31	degrees C		1	04/24/2023 09:25	04/24/2023 09:25	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	184	mg/L	25	5	04/27/2023 10:51	04/27/2023 10:51	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	0.22	mg/L	0.1	1	04/26/2023 18:02	04/28/2023 16:03	SLZ	
Calcium	92.4	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:45	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	7.5	units	0.1	1	04/27/2023 03:45	04/27/2023 03:45	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	38.6	mg/L	2.0	1	04/28/2023 10:29	04/28/2023 10:29	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.46	mg/L	0.1	1	04/27/2023 03:45	04/27/2023 03:45	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561002 **Date Collected:** 04/24/2023 09:25 **Matrix:** Groundwater
Sample ID: MW110 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	719	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561003 **Date Collected:** 04/24/2023 10:55 **Matrix:** Groundwater
Sample ID: MW119 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	1048	umhos/cm	1	1	04/24/2023 10:55	04/24/2023 10:55	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	7.65	units	0.01	1	04/24/2023 10:55	04/24/2023 10:55	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	7.8	degrees C		1	04/24/2023 10:55	04/24/2023 10:55	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	178	mg/L	25	5	04/27/2023 10:52	04/27/2023 10:52	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	0.22	mg/L	0.1	1	04/26/2023 18:02	04/28/2023 16:05	SLZ	
Calcium	91.2	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:45	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	7.4	units	0.1	1	04/27/2023 03:35	04/27/2023 03:35	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	36.8	mg/L	2.0	1	04/28/2023 10:30	04/28/2023 10:30	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.42	mg/L	0.1	1	04/27/2023 03:35	04/27/2023 03:35	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561003 **Date Collected:** 04/24/2023 10:55 **Matrix:** Groundwater
Sample ID: MW119 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	698	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561004 **Date Collected:** 04/25/2023 07:13 **Matrix:** Groundwater
Sample ID: MW111 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	3468	umhos/cm	1	1	04/25/2023 07:13	04/25/2023 07:13	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	7.52	units	0.01	1	04/25/2023 07:13	04/25/2023 07:13	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	4.69	degrees C		1	04/25/2023 07:13	04/25/2023 07:13	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	2060	mg/L	250	50	04/27/2023 10:59	04/27/2023 10:59	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	8.01	mg/L	2	20	04/26/2023 18:02	04/28/2023 16:06	SLZ	
Calcium	182	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:48	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	7.8	units	0.1	1	04/27/2023 02:17	04/27/2023 02:17	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	40.6	mg/L	2.0	1	04/28/2023 10:31	04/28/2023 10:31	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	1.98	mg/L	0.1	1	04/27/2023 02:17	04/27/2023 02:17	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561004 **Date Collected:** 04/25/2023 07:13 **Matrix:** Groundwater
Sample ID: MW111 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	3760	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561005 **Date Collected:** 04/24/2023 13:47 **Matrix:** Groundwater
Sample ID: MW117 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	6000	umhos/cm	1	1	04/24/2023 13:47	04/24/2023 13:47	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	7.52	units	0.01	1	04/24/2023 13:47	04/24/2023 13:47	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	6.75	degrees C		1	04/24/2023 13:47	04/24/2023 13:47	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	4580	mg/L	250	50	04/27/2023 11:01	04/27/2023 11:01	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	7.53	mg/L	0.5	5	04/26/2023 18:02	04/28/2023 16:07	SLZ	
Calcium	322	mg/L	5	5	04/26/2023 18:02	04/27/2023 11:49	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	7.3	units	0.1	1	04/27/2023 02:40	04/27/2023 02:40	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	41.5	mg/L	2.0	1	04/28/2023 10:32	04/28/2023 10:32	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.19	mg/L	0.1	1	04/27/2023 02:40	04/27/2023 02:40	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561005 **Date Collected:** 04/24/2023 13:47 **Matrix:** Groundwater
Sample ID: MW117 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	7040	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561006 **Date Collected:** 04/25/2023 08:21 **Matrix:** Groundwater
Sample ID: MW118 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	1571	umhos/cm	1	1	04/25/2023 08:21	04/25/2023 08:21	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	7.75	units	0.01	1	04/25/2023 08:21	04/25/2023 08:21	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	5.72	degrees C		1	04/25/2023 08:21	04/25/2023 08:21	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	579	mg/L	25	5	04/27/2023 10:55	04/27/2023 10:55	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	1.42	mg/L	0.5	5	04/26/2023 18:02	04/28/2023 16:07	SLZ	
Calcium	101	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:50	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	8.0	units	0.1	1	04/27/2023 03:24	04/27/2023 03:24	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	27.2	mg/L	2.0	1	04/28/2023 10:33	04/28/2023 10:33	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.85	mg/L	0.1	1	04/27/2023 03:24	04/27/2023 03:24	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561006 **Date Collected:** 04/25/2023 08:21 **Matrix:** Groundwater
Sample ID: MW118 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	1260	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561007 **Date Collected:** 04/24/2023 12:30 **Matrix:** Groundwater
Sample ID: MW120 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: 120.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Specific Conductance - Field	5786	umhos/cm	1	1	04/24/2023 12:30	04/24/2023 12:30	JSM	

Method: 150.2

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH - Field	6.95	units	0.01	1	04/24/2023 12:30	04/24/2023 12:30	JSM	

Method: 170.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Temperature - Field C	7.69	degrees C		1	04/24/2023 12:30	04/24/2023 12:30	JSM	

Method: ASTM D516-16

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	4060	mg/L	500	100	04/27/2023 11:02	04/27/2023 11:02	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	10.0	mg/L	0.5	5	04/26/2023 18:02	04/28/2023 16:08	SLZ	
Calcium	458	mg/L	5	5	04/26/2023 18:02	04/27/2023 11:51	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	7.2	units	0.1	1	04/27/2023 02:51	04/27/2023 02:51	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	64.6	mg/L	2.0	1	04/28/2023 10:39	04/28/2023 10:39	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.41	mg/L	0.1	1	04/27/2023 02:51	04/27/2023 02:51	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561007 **Date Collected:** 04/24/2023 12:30 **Matrix:** Groundwater
Sample ID: MW120 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	7130	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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 www.MVT L.com

**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561008 **Date Collected:** 04/24/2023 14:52 **Matrix:** Groundwater
Sample ID: Dup 1 **Date Received:** 04/26/2023 08:00 **Collector:** MVT L Field Service

Temp @ Receipt (C): 3.4**Method: ASTM D516-16**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	356	mg/L	25	5	04/27/2023 10:57	04/27/2023 10:57	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	<1	mg/L	1	10	04/26/2023 18:02	04/28/2023 16:09	SLZ	
Calcium	94.3	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:51	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	8.2	units	0.1	1	04/27/2023 00:22	04/27/2023 00:22	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	24.3	mg/L	2.0	1	04/28/2023 10:40	04/28/2023 10:40	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	0.62	mg/L	0.1	1	04/27/2023 00:22	04/27/2023 00:22	RAA	

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	914	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561009 **Date Collected:** 04/25/2023 06:40 **Matrix:** Groundwater
Sample ID: Field Blank (FB) **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: ASTM D516-16**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Sulfate	<5	mg/L	5	1	04/27/2023 10:58	04/27/2023 10:58	EJV	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Boron	<0.1	mg/L	0.1	1	04/26/2023 18:02	04/28/2023 16:10	SLZ	
Calcium	<1	mg/L	1	1	04/26/2023 18:02	04/27/2023 11:52	SLZ	

Method: SM4500 H+ B-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
pH	6.7	units	0.1	1	04/27/2023 02:08	04/27/2023 02:08	RAA	*

Method: SM4500-CI-E 2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Chloride	<2.0	mg/L	2.0	1	04/28/2023 10:42	04/28/2023 10:42	EJV	

Method: SM4500-F-C-2011

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Fluoride	<0.1	mg/L	0.1	1	04/27/2023 02:08	04/27/2023 02:08	RAA	

Method: USGS I-1750-85

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Total Dissolved Solids	<10	mg/L	10	1	05/01/2023 12:53	05/01/2023 12:53	RAA	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

	Minnesota Valley Testing Laboratories 2616 E. Broadway Ave Bismarck, ND 58501 (701) 258-9720	Montana - Dakota Utilities WO: 13561 	Chain of Custody Record
	Report To: MDU Attn: Todd Peterson Address: 400 N. 4th St Bismarck, ND 58501 Phone: 701-425-2427 Email: Todd.Peterson@mdu.com	CC:	Project Name: MDU Lewis & Clark Event: Spring 2023 Sampled By: <i>[Signature]</i>

Lab Number	Sample ID	Date	Time	Sample Type	Sample Containers				Field Readings				Analysis Required
					1 Liter Raw	500 mL HNO3	500 mL HNO3 (filtered)	250 mL H2SO4	Temp (°C)	Spec. Cond.	pH	Turbidity (NTU)	
001	MW103	24 Apr 23	1452	GW	X	X	X	X	8.78	122.5	7.67	42.15	MDU Lewis & Clark List
002	MW110	24 Apr 23	0925	GW	X	X	X	X	7.31	106.5	7.75	44.63	
003	MW119	24 Apr 23	1055	GW	X	X	X	X	7.80	104.8	7.65	13.42	
004	MW111	25 Apr 23	0713	GW	X	X	X	X	4.69	346.8	7.52	1.24	
005	MW117	24 Apr 23	1347	GW	X	X	X	X	6.75	600.0	7.52	4.98	
006	MW118	25 Apr 23	0821	GW	X	X	X	X	5.72	157.1	7.75	1.36	
007	MW120	24 Apr 23	1230	GW	X	X	X	X	7.69	578.6	6.95	0.26	
008	Dup 1	24 Apr 23	1452	GW	X	X	X	X	—	—	—	—	
009	Field Blank (FB)	25 Apr 23	0640	GW	X	X	X	X	NA	NA	NA	NA	

Comments:

Relinquished By		Sample Condition		Received By	
Name	Date/Time	Location	Temp (°C)	Name	Date/Time
<i>[Signature]</i>	26 Apr 23 0700	Log In Walk In #2	3.4 TMS62 / TM805	<i>[Signature]</i>	26 Apr 23 0800

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



Field Datasheet
Surface water Assessment

Company: MDU Lewis & Clark
Event: Spring 2023
Sampling Personal: *J. P.*

2616 E. Broadway Ave, Bismarck, ND
Phone: (701) 258-9720

Weather Conditions: Temp: 45 °F Wind: @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

Well ID	Date	Time	Casing Diameter	Water Level (ft)	Comments
MW101	24 Apr 23	1146	2"	8.97	
MW105		1406	2"	8.56	
MW106		1404	2"	9.08	
MW107		1144	2"	4.20	
MW108		1620	2"	16.92	
MW116		1402	2"	13.82	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 103
 Sampling Personal: [Signature]

Weather Conditions: Temp: 50 °F Wind: E @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES NO
Well Labeled?	YES NO
Casing Strait?	YES NO
Grout Seal Intact?	YES NO Not Visible
Repairs Necessary?	
Casing Diameter:	2"
Water Level Before Purge:	10.39 ft
Total Depth of Well:	ft
Well Volume:	liters
Depth to Top of Pump:	ft
Water Level After Sample:	10.41 ft
Measurement Method:	Electric Water Level Indicator

SAMPLING INFORMATION	
Purging Method:	Bladder
Sampling Method:	Bladder
Dedicated Equipment?	YES NO
Duplicate Sample?	YES NO
Duplicate Sample ID:	Dup 1
Bottle List:	
1 Liter Raw	4- 1L Nitric
500mL Nitric	
500mL Nitric (filtered)	
250mL Sulfuric	

Control Settings:	
Purge:	5 Sec.
Recover:	75 Sec.
PSI:	20

FIELD READINGS

Stabilization Parameters (3 Consecutive)		Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (ml/Min)	mL Removed	Appearance or Comment
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10					clear, slightly turbid, turbid
24 Apr 23	1412	Start of Well Purge									
	1417	9.56	1492	7.64	1.56	178.0	110.54	10.40	100.0	500.0	Clear
	1437	8.64	1266	7.66	0.46	177.8	65.12	10.40	100.0	200.0	Clear
	1442	8.75	1232	7.69	0.92	162.7	48.80	10.40	100.0	500.0	Clear
	1447	8.88	1225	7.66	0.96	185.6	44.8	10.40	100.0	500.0	Clear
	1452	8.98	1225	7.67	6.02	180.1	42.15	10.40	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 4000.0 ml

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
24 Apr 23	1452	8.78	1225	7.67	42.15	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



Field Datasheet

Groundwater Assessment

2616 E. Broadway Ave, Bismarck, ND

Phone: (701) 258-9720

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 110
 Sampling Personal: [Signature]

Weather Conditions: Temp: 40 °F Wind: S @ 5-10 Precip: Sunny/ Partly Cloudy / Cloudy

WELL INFORMATION		
Well Locked?	YES	NO
Well Labeled?	<u>YES</u>	NO
Casing Strait?	YES	NO
Grout Seal Intact?	<u>YES</u>	NO
Repairs Necessary?	Not Visible	
Casing Diameter:	2"	
Water Level Before Purge:	<u>8.91</u>	ft
Total Depth of Well:	<u>16.85</u>	ft
Well Volume:	liters	
Depth to Top of Pump:	ft	
Water Level After Sample:	<u>9.06</u>	ft
Measurement Method:	Electric Water Level Indicator	

SAMPLING INFORMATION		
Purging Method:	Bladder	
Sampling Method:	Bladder	
Dedicated Equipment?	<u>YES</u>	NO
Duplicate Sample?	YES	NO
Duplicate Sample ID:		
Bottle List:		
1 Liter Raw	4- 1L Nitric	
500mL Nitric		
500mL Nitric (filtered)		
250mL Sulfuric		
Control Settings:		
Purge:	<u>5</u>	Sec.
Recover:	<u>5</u>	Sec.
PSI:	<u>20</u>	

FIELD READINGS

Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (ml/Min)	mL Removed	Appearance or Comment	
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10				clear, slightly turbid, turbid	
24 Apr 23	0850	Start of Well Purge									
	0905	<u>6.65</u>	<u>1079</u>	<u>7.70</u>	<u>3.04</u>	<u>193.7</u>	<u>75.27</u>	<u>9.01</u>	<u>100.0</u>	<u>500.0</u>	Clear
	0910	<u>6.87</u>	<u>1066</u>	<u>7.78</u>	<u>3.45</u>	<u>225.1</u>	<u>63.08</u>	<u>9.05</u>	<u>100.0</u>	<u>1500.0</u>	Clear
	0915	<u>7.03</u>	<u>1066</u>	<u>7.74</u>	<u>3.44</u>	<u>227.1</u>	<u>44.44</u>	<u>9.06</u>	<u>100.0</u>	<u>500.0</u>	Clear
	0920	<u>7.18</u>	<u>1068</u>	<u>7.75</u>	<u>3.55</u>	<u>235.9</u>	<u>43.11</u>	<u>9.05</u>	<u>100.0</u>	<u>500.0</u>	Clear
	0925	<u>7.31</u>	<u>1065</u>	<u>7.75</u>	<u>3.58</u>	<u>230.6</u>	<u>44.63</u>	<u>9.06</u>	<u>100.0</u>	<u>500.0</u>	Clear

Well Stabilized? YES NO Total Volume Purged: 3500.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
24 Apr 23	0925	<u>7.31</u>	<u>1065</u>	<u>7.75</u>	<u>44.63</u>	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



Field Datasheet

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 119
 Sampling Personal: hch

2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Weather Conditions: Temp: 45 °F Wind: E @ 10-13 Precip: Sunny/ Partly Cloudy / Cloudy

WELL INFORMATION		
Well Locked?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Well Labeled?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Casing Strait?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Grout Seal Intact?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Repairs Necessary?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
Casing Diameter:	<u>2"</u>	
Water Level Before Purge:	<u>8.74</u>	ft
Total Depth of Well:	ft	
Well Volume:	liters	
Depth to Top of Pump:	ft	
Water Level After Sample:	<u>8.75</u>	ft
Measurement Method:	<u>Electric Water Level Indicator</u>	

SAMPLING INFORMATION		
Purging Method:	<u>Bladder</u>	
Sampling Method:	<u>Bladder</u>	
Dedicated Equipment?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Duplicate Sample?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
Duplicate Sample ID:	-	
Bottle List:		
1 Liter Raw	4- 1L Nitric	
500mL Nitric		
500mL Nitric (filtered)		
250mL Sulfuric		

Control Settings:	
Purge:	<u>3</u> Sec.
Recover:	<u>27</u> Sec.
PSI:	<u>20</u>

FIELD READINGS

Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate ml/Min	mL Removed	Appearance or Comment	
										Clarity, Color, Odor, Ect.	
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10				clear, slightly turbid, turbid	
<u>24 Apr 23</u>	<u>1020</u>	Start of Well Purge									
	<u>1025</u>	<u>7.86</u>	<u>1019</u>	<u>7.67</u>	<u>2.12</u>	<u>218.1</u>	<u>108.44</u>	<u>8.75</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>1040</u>	<u>7.95</u>	<u>1049</u>	<u>7.71</u>	<u>1.55</u>	<u>216.7</u>	<u>63.33</u>	<u>8.75</u>	<u>100.0</u>	<u>1500.0</u>	<u>Clear</u>
	<u>1045</u>	<u>8.04</u>	<u>1054</u>	<u>7.65</u>	<u>1.87</u>	<u>220.1</u>	<u>41.18</u>	<u>8.76</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>1050</u>	<u>7.94</u>	<u>1043</u>	<u>7.64</u>	<u>1.74</u>	<u>213.6</u>	<u>17.77</u>	<u>8.76</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>1055</u>	<u>7.80</u>	<u>1048</u>	<u>7.65</u>	<u>1.83</u>	<u>215.8</u>	<u>13.42</u>	<u>8.76</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>

Well Stabilized? YES NO Total Volume Purged: 3500.0 ml

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
<u>24 Apr 23</u>	<u>1055</u>	<u>7.80</u>	<u>1048</u>	<u>7.65</u>	<u>13.42</u>	<u>Clear</u>

Comments:

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 www.MVTL.com



Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 111
 Sampling Personal: J. Kelly

Weather Conditions: Temp: 35 °F Wind: N @ 5-10 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Well Labeled?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Casing Strait?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Grout Seal Intact?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> <u>Not Visible</u>
Repairs Necessary?	
Casing Diameter:	<u>2"</u>
Water Level Before Purge:	<u>2.49</u> ft
Total Depth of Well:	ft
Well Volume:	liters
Depth to Top of Pump:	ft
Water Level After Sample:	ft
Measurement Method:	<u>Electric Water Level Indicator</u>

SAMPLING INFORMATION	
Purging Method:	<u>Bladder</u>
Sampling Method:	<u>Bladder</u>
Dedicated Equipment?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample ID:	
Bottle List:	
1 Liter Raw	4- 1L Nitric
500ml Nitric	
500ml Nitric (filtered)	
250ml Sulfuric	

Control Settings:	
Purge:	<u>5</u> Sec.
Recover:	<u>25</u> Sec.
PSI:	<u>20</u>

FIELD READINGS

Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate mL/Min	mL Removed	Appearance or Comment	
										Clarity, Color, Odor, Ect.	
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10				clear, slightly turbid, turbid	
<u>25 Apr 23</u>	<u>0633</u>										
	<u>0638</u>	<u>5.48</u>	<u>3498</u>	<u>7.32</u>	<u>1.26</u>	<u>162.3</u>	<u>40.16</u>	<u>7.61</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>0653</u>	<u>4.00</u>	<u>3498</u>	<u>7.48</u>	<u>3.96</u>	<u>141.7</u>	<u>18.17</u>	<u>7.60</u>	<u>100.0</u>	<u>1500.0</u>	<u>Clear</u>
	<u>0658</u>	<u>4.77</u>	<u>3431</u>	<u>7.58</u>	<u>4.17</u>	<u>136.7</u>	<u>9.80</u>	<u>7.60</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>0703</u>	<u>4.73</u>	<u>3380</u>	<u>7.58</u>	<u>4.57</u>	<u>150.3</u>	<u>6.25</u>	<u>7.61</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>0708</u>	<u>4.73</u>	<u>3436</u>	<u>7.54</u>	<u>4.62</u>	<u>143.6</u>	<u>2.74</u>	<u>7.61</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>
	<u>0713</u>	<u>4.69</u>	<u>3468</u>	<u>7.52</u>	<u>4.55</u>	<u>141.7</u>	<u>1.24</u>	<u>7.61</u>	<u>100.0</u>	<u>500.0</u>	<u>Clear</u>

Well Stabilized? YES NO Total Volume Purged: 4000.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
<u>25 Apr 23</u>	<u>0713</u>	<u>4.69</u>	<u>3468</u>	<u>7.52</u>	<u>1.24</u>	<u>Clear</u>

Comments: Collected field blank @ 0640

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www.MVTL.com



Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
Event: Spring 2023
Sample ID: 117
Sampling Personal: [Signature]

Weather Conditions: Temp: 50°F Wind: E @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES NO
Well Labeled?	YES NO
Casing Strait?	YES NO
Grout Seal Intact?	YES NO Not Visible
Repairs Necessary?	
Casing Diameter:	2"
Water Level Before Purge:	5.00 ft
Total Depth of Well:	11.50 ft
Well Volume:	4.0 liters
Depth to Top of Pump:	9.01 ft
Water Level After Sample:	Below Pump ft
Measurement Method:	Electric Water Level Indicator

SAMPLING INFORMATION	
Purging Method:	Bladder
Sampling Method:	Bladder
Dedicated Equipment?	YES NO
Duplicate Sample?	YES NO
Duplicate Sample ID:	
Bottle List:	
1 Liter Raw	4- 1L Nitric
500mL Nitric	
500mL Nitric (filtered)	
250mL Sulfuric	
Control Settings:	
Purge:	5 Sec.
Recover:	25 Sec.
PSI:	20

FIELD READINGS

Stabilization Parameters (3 Consecutive)		Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (mL/Min)	mL Removed	Appearance or Comment
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10					Clarity, Color, Odor, Ect.
Start of Well Purge											
24 Apr 23	1317										
	1317	7.09	5884	7.49	5.89	232.7	6.17	6.55	100.0	500.0	Clear
	1322	7.11	5915	7.50	5.86	238.3	4.82	6.97	100.0	500.0	Clear
	1337	6.99	5981	7.53	6.38	179.4	10.17	7.46	100.0	1500.0	Clear
	1342	7.05	5971	7.54	6.49	176.0	8.12	7.84	100.0	500.0	Clear
	1347	6.75	6000	7.52	6.39	184.2	4.98	8.23	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 3500.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
Clarity, Color, Odor, Ect.						
24 Apr 23	1347	6.75	6000	7.52	4.98	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 118
 Sampling Personal: J. J. J.

Weather Conditions: Temp: 35 °F Wind: N @ 5-10 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION		
Well Locked?	YES	(NO)
Well Labeled?	YES	NO
Casing Strait?	YES	NO
Grout Seal Intact?	YES	NO Not Visible
Repairs Necessary?		
Casing Diameter:	2"	
Water Level Before Purge:	8.15 ft	
Total Depth of Well:	ft	
Well Volume:	liters	
Depth to Top of Pump:	ft	
Water Level After Sample:	8.22 ft	
Measurement Method:	Electric Water Level Indicator	

SAMPLING INFORMATION		
Purging Method:	Bladder	
Sampling Method:	Bladder	
Dedicated Equipment?	YES	(NO)
Duplicate Sample?	YES	(NO)
Duplicate Sample ID:		
Bottle List:		
1 Liter Raw	4- 1L Nitric	
500mL Nitric		
500mL Nitric (filtered)		
250mL Sulfuric		

Control Settings:	
Purge:	5 Sec.
Recover:	25 Sec.
PSI:	20

FIELD READINGS

Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate mL/Min	mL Removed	Appearance or Comment Clarity, Color, Odor, Ect.
Purge Date	Time	±0.5*	±0.1	±10%	±10					clear, slightly turbid, turbid
25 Apr 23	0746	Start of Well Purge								
	0757	5.72	1579	7.70	2.07	170.9	8.24	100.0	500.0	Slightly Turbid
	0806	5.59	1576	7.74	1.76	111.4	8.21	100.0	1500.0	Clear
	0811	5.67	1575	7.77	1.79	110.9	8.22	100.0	500.0	Clear
	0816	5.66	1568	7.75	1.87	117.7	8.22	100.0	500.0	Clear
	0821	5.72	1571	7.75	1.78	115.6	8.22	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 3500.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment Clarity, Color, Odor, Ect.
25 Apr 23	0821	5.72	1571	7.75	1.36	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 120
 Sampling Personal: Jrky

Weather Conditions: Temp: 50 °F Wind: E @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Well Labeled?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Casing Strait?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Grout Seal Intact?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> <u>Not Visible</u>
Repairs Necessary?	
Casing Diameter:	<u>2"</u>
Water Level Before Purge:	<u>14.81</u> ft
Total Depth of Well:	<u>18.88</u> ft
Well Volume:	<u>2.5</u> liters
Depth to Top of Pump:	<u>—</u> ft
Water Level After Sample:	<u>15.32</u> ft
Measurement Method:	<u>Electric Water Level Indicator</u>

SAMPLING INFORMATION	
Purging Method:	<u>Bladder</u>
Sampling Method:	<u>Bladder</u>
Dedicated Equipment?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Duplicate Sample?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample ID:	
Bottle List:	
1 Liter Raw	4- 1L Nitric
500mL Nitric	
500mL Nitric (filtered)	
250mL Sulfuric	

Control Settings:	
Purge:	<u>3</u> Sec.
Recover:	<u>47</u> Sec.
PSI:	<u>20</u>

FIELD READINGS

Stabilization Parameters (3 Consecutive)		Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate mL/Min	mL Removed	Appearance or Comment
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10					Clarity, Color, Odor, Ect.
	1155	Start of Well Purge									
24 Apr 23	1200	8.26	5505	6.96	0.95	173.4	3.02	15.06	100.0	500.0	Clear
	1215	7.75	5443	6.97	0.99	140.4	0.35	15.24	100.0	500.0	Clear
	1220	7.71	5579	6.97	1.14	152.3	0.34	15.26	100.0	500.0	Clear
	1225	7.62	5665	6.97	1.02	160.3	0.31	15.27	100.0	500.0	Clear
	1230	7.69	5786	6.95	1.06	168.2	0.26	15.29	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 3500.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
24 Apr 23	1230	7.69	5786	6.95	0.26	Clear

Comments:

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Report Date: Friday, May 5, 2023 3:41:14 PM

	MB	Chloride	04/28/2023 10:35:03	<2.0		mg/L									
	MB	Chloride	04/28/2023 10:18:29	<2.0		mg/L									
13561001	MS-F	Fluoride	04/26/2023 22:29:58	102	0.65	mg/L	0.5	1.16	102				80	120	
13561001	MSD-F	Fluoride	04/26/2023 22:35:50	104	0.65	mg/L				1.17	104	0.86	80	120	20
13561004	MS-F	Fluoride	04/27/2023 02:28:20	96	1.98	mg/L	0.5	2.46	96				80	120	
13561004	MSD-F	Fluoride	04/27/2023 02:34:19	92	1.98	mg/L				2.44	92	0.82	80	120	20
13563002	MS-F	Fluoride	04/26/2023 12:59:18	108	0.46	mg/L	0.5	1	108				80	120	
13563002	MSD-F	Fluoride	04/26/2023 13:05:20	110	0.46	mg/L				1.01	110	1.00	80	120	20
13571020	MS-F	Fluoride	04/26/2023 18:19:22	92	0.65	mg/L	0.5	1.11	92				80	120	
13571020	MSD-F	Fluoride	04/26/2023 18:25:11	94	0.65	mg/L				1.12	94	0.90	80	120	20
	CRM-F	Fluoride	04/26/2023 10:33:33	103		mg/L	3.39	3.5	103				83.8	111	
	LFB-F	Fluoride	04/26/2023 16:19:41	104		mg/L	0.5	0.52	104				90	110	
	LFB-F	Fluoride	04/26/2023 21:02:13	102		mg/L	0.5	0.51	102				90	110	
	LFB-F	Fluoride	04/26/2023 10:45:58	102		mg/L	0.5	0.51	102				90	110	
	LFB-F	Fluoride	04/27/2023 01:28:34	102		mg/L	0.5	0.51	102				90	110	
	LFB-F	Fluoride	04/27/2023 04:33:42	102		mg/L	0.5	0.51	102				90	110	
	MB-F	Fluoride	04/26/2023 10:39:30	<0.1		mg/L									
	MB-F	Fluoride	04/27/2023 04:27:23	<0.1		mg/L									
	MB-F	Fluoride	04/27/2023 01:22:15	<0.1		mg/L									
	MB-F	Fluoride	04/26/2023 20:55:54	<0.1		mg/L									
	MB-F	Fluoride	04/26/2023 16:13:22	<0.1		mg/L									
13561007	MS	Sulfate	04/27/2023 11:03:11	94.6	4060	mg/L	10000	13500	94.6				85	115	
13561007	MSD	Sulfate	04/27/2023 11:04:17	94.4	4060	mg/L				13500	94.4	0.00	85	115	20
13563001	MS	Sulfate	04/27/2023 11:20:51	86.2	895	mg/L	1000	1760	86.2				85	115	
13563001	MSD	Sulfate	04/27/2023 11:24:09	81.1	895	mg/L				1700	81.1	3.50	85	115	20
13571008	MS	Sulfate	04/27/2023 11:40:43	94.5	2560	mg/L	2000	4440	94.5				85	115	
13571008	MSD	Sulfate	04/27/2023 11:41:48	91.2	2560	mg/L				4380	91.2	1.40	85	115	20
13571018	MS	Sulfate	04/27/2023 12:01:43	89.2	9160	mg/L	10000	18100	89.2				85	115	
13571018	MSD	Sulfate	04/27/2023 12:02:48	92.5	9160	mg/L				18400	92.5	1.60	85	115	20
13702001	MS	Sulfate	04/27/2023 12:19:23	94.6	582	mg/L	2000	2470	94.6				85	115	
13702001	MSD	Sulfate	04/27/2023 12:20:29	95.8	582	mg/L				2500	95.8	1.20	85	115	20
	LFB	Sulfate	04/27/2023 12:22:41	94		mg/L	100	94	94				85	115	
	LFB	Sulfate	04/27/2023 10:45:32	101		mg/L	100	101	101				85	115	
	LFB	Sulfate	04/27/2023 11:46:14	94.6		mg/L	100	94.6	94.6				85	115	
	LFB	Sulfate	04/27/2023 11:06:30	99.6		mg/L	100	99.6	99.6				85	115	
	LFB	Sulfate	04/27/2023 12:06:07	95		mg/L	100	95	95				85	115	
	LFB	Sulfate	04/27/2023 11:26:22	97.9		mg/L	100	97.9	97.9				85	115	
	MB	Sulfate	04/27/2023 12:21:35	<5		mg/L									
	MB	Sulfate	04/27/2023 12:05:01	<5		mg/L									
	MB	Sulfate	04/27/2023 11:45:08	<5		mg/L									
	MB	Sulfate	04/27/2023 11:25:15	<5		mg/L									
	MB	Sulfate	04/27/2023 11:05:23	<5		mg/L									
	MB	Sulfate	04/27/2023 10:44:25	<5		mg/L									
13561007	DUP	Total Dissolved Solids	05/01/2023 12:53:00	7200	7130	mg/L						0.98			20
13703004	DUP	Total Dissolved Solids	05/01/2023 12:53:00	8280	8230	mg/L						0.60			20
13843005	DUP	Total Dissolved Solids	05/01/2023 12:53:00	1920	1930	mg/L						0.52			20
	CRM	Total Dissolved Solids	05/01/2023 12:53:00	106		mg/L	736	784	106				90.35	110.33	
	CRM	Total Dissolved Solids	05/01/2023 12:53:00	99		mg/L	736	728	99				90.35	110.33	
	MB	Total Dissolved Solids	05/01/2023 12:53:00	<10		mg/L									
	MB	Total Dissolved Solids	05/01/2023 12:53:00	<10		mg/L									
13561002	DUP	pH	04/27/2023 03:55:25	8.03	7.5	units						6.82			20
13571001	DUP	pH	04/26/2023 13:27:47	7.16	7.3	units						1.94			20
13571012	DUP	pH	04/26/2023 23:13:57	7.58	7.6	units						0.26			20
13571021	DUP	pH	04/26/2023 17:53:09	7.34	7.7	units						4.79			20
	CRM-PH	pH	04/27/2023 04:51:21	98.83		units	6	5.9	98.83				98.33	101.67	
	CRM-PH	pH	04/27/2023 01:46:09	98.33		units	6	5.9	98.33				98.33	101.67	
	CRM-PH	pH	04/26/2023 21:19:52	99		units	6	5.9	99				98.33	101.67	
	CRM-PH	pH	04/26/2023 10:03:29	99.83		units	6	6	99.83				98.33	101.67	
	CRM-PH	pH	04/26/2023 16:37:25	99.33		units	6	6	99.33				98.33	101.67	



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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Workorder Summary

Workorder Comments

All analytes with dilution factors greater than 1 (displayed in DF column) required dilution due to matrix or high concentration of target analyte unless otherwise noted and reporting limits (RDL column) have been adjusted accordingly.

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561001 **Date Collected:** 04/24/2023 14:52 **Matrix:** Groundwater
Sample ID: MW103 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: EPA 245.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.0430	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:37	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	0.0068	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Arsenic	0.0043	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Barium	0.0514	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Cobalt	0.0109	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Lead	0.0007	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Molybdenum	0.0201	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Selenium	0.0404	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 16:43	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:43	MDE	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561002 **Date Collected:** 04/24/2023 09:25 **Matrix:** Groundwater
Sample ID: MW110 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: EPA 245.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.0329	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:37	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Barium	0.0396	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Lead	0.0008	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Molybdenum	0.0030	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Selenium	<0.005	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 16:47	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:47	MDE	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561003 **Date Collected:** 04/24/2023 10:55 **Matrix:** Groundwater
Sample ID: MW119 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: EPA 245.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.0333	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:38	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Barium	0.0296	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Lead	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Molybdenum	0.0035	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Selenium	<0.005	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 16:51	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:51	MDE	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561004 **Date Collected:** 04/25/2023 07:13 **Matrix:** Groundwater
Sample ID: MW111 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: EPA 245.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.158	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:38	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Barium	0.0205	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Lead	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Molybdenum	0.0546	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Selenium	0.0777	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 16:55	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:55	MDE	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561005 **Date Collected:** 04/24/2023 13:47 **Matrix:** Groundwater
Sample ID: MW117 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: EPA 245.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.107	mg/L	0.1	5	04/26/2023 18:02	04/28/2023 10:39	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Barium	0.0130	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Chromium	0.0032	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Lead	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Molybdenum	0.0032	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Selenium	0.0320	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 16:59	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 16:59	MDE	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13561006 **Date Collected:** 04/25/2023 08:21 **Matrix:** Groundwater
Sample ID: MW118 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4

Method: EPA 245.1

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.0648	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:39	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Barium	0.0234	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Lead	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Molybdenum	0.0233	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Selenium	0.0637	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 17:20	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:20	MDE	

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**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561007 **Date Collected:** 04/24/2023 12:30 **Matrix:** Groundwater
Sample ID: MW120 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: EPA 245.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.109	mg/L	0.1	5	04/26/2023 18:02	04/28/2023 10:40	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Barium	0.0154	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Lead	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Molybdenum	0.0020	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Selenium	<0.005	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 17:25	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:25	MDE	

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1126 North Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
 2616 East Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724
 1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
 www.MVTL.com

**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561008 **Date Collected:** 04/24/2023 14:52 **Matrix:** Groundwater
Sample ID: Dup 1 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: EPA 245.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	0.0003	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	0.0447	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:40	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	0.0059	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Arsenic	0.0033	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Barium	0.0502	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Cobalt	0.0110	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Lead	0.0007	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Molybdenum	0.0209	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Selenium	0.0328	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 17:29	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:29	MDE	

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 www.MVTL.com

**Account #:** 2800**Client:** Montana-Dakota Utilities - Bismarck**Analytical Results**

Lab ID: 13561009 **Date Collected:** 04/25/2023 06:40 **Matrix:** Groundwater
Sample ID: Field Blank (FB) **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 3.4**Method: EPA 245.1**

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Mercury	<0.0002	mg/L	0.0002	1	05/02/2023 16:20	05/03/2023 11:15	MDE	

Method: EPA 6010D

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Lithium	<0.02	mg/L	0.02	1	04/26/2023 18:02	04/28/2023 10:41	SLZ	

Method: EPA 6020B

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Antimony	<0.001	mg/L	0.001	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Arsenic	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Barium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Beryllium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Cadmium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Chromium	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Cobalt	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Lead	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Molybdenum	<0.002	mg/L	0.002	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Selenium	<0.005	mg/L	0.005	5	04/26/2023 18:02	05/03/2023 17:33	MDE	
Thallium	<0.0005	mg/L	0.0005	5	04/26/2023 18:02	05/03/2023 17:33	MDE	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

	Minnesota Valley Testing Laboratories	Montana – Dakota Utilities	Chain of Custody Record
	2616 E. Broadway Ave Bismarck, ND 58501 (701) 258-9720	WO: 13561 	

Report To: MDU	CC:	Project Name: MDU Lewis & Clark
Attn: Todd Peterson		Event: Spring 2023
Address: 400 N. 4th St Bismarck, ND 58501		Sampled By: <i>[Signature]</i>
Phone: 701-425-2427		
Email: Todd.Peterson@mdu.com		

Lab Number	Sample ID	Sample Information		Sample Type	Sample Containers				Field Readings				Analysis Required
		Date	Time		1 Liter Raw	500 mL HNO3	500 mL HNO3 (filtered)	250 mL H2SO4	Temp (°C)	Spec. Cond.	pH	Turbidity (NTU)	
001	MW103	24 Apr 23	1452	GW	X	X	X	X	8.78	122.5	7.67	42.15	MDU Lewis & Clark List
002	MW110	24 Apr 23	0925	GW	X	X	X	X	7.31	106.5	7.75	44.63	
003	MW119	24 Apr 23	1055	GW	X	X	X	X	7.80	104.8	7.65	13.42	
004	MW111	25 Apr 23	0713	GW	X	X	X	X	4.69	346.8	7.52	1.24	
005	MW117	24 Apr 23	1347	GW	X	X	X	X	6.75	600.0	7.52	4.98	
006	MW118	25 Apr 23	0821	GW	X	X	X	X	5.72	157.1	7.75	1.36	
007	MW120	24 Apr 23	1230	GW	X	X	X	X	7.69	578.6	6.95	0.26	
008	Dup 1	24 Apr 23	1452	GW	X	X	X	X	—	—	—	—	
009	Field Blank (FB)	25 Apr 23	0640	GW	X	X	X	X	NA	NA	NA	NA	

Comments:

Relinquished By		Sample Condition		Received By	
Name	Date/Time	Location	Temp (°C)	Name	Date/Time
<i>[Signature]</i>	26 Apr 23 0700	Log In Walk In #2	3.4 TMS62 / TM805	<i>[Signature]</i>	26 Apr 23 0800

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
Phone: (701) 258-9720

Field Datasheet
Surface water Assessment

Company: MDU Lewis & Clark
Event: Spring 2023
Sampling Personal: J. K.

Weather Conditions: Temp: 45 °F Wind: W @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

Well ID	Date	Time	Casing Diameter	Water Level (ft)	Comments
MW101	24 Apr 23	1146	2"	8.97	
MW105		1406	2"	8.56	
MW106		1404	2"	9.08	
MW107		1144	2"	4.20	
MW108		1620	2"	16.92	
MW116		1402	2"	13.82	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 103
 Sampling Personal: [Signature]

Weather Conditions: Temp: 50 °F Wind: E @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Well Labeled?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Casing Strait?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Grout Seal Intact?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> <u>Not Visible</u>
Repairs Necessary?	
Casing Diameter:	<u>2"</u>
Water Level Before Purge:	<u>10.39</u> ft
Total Depth of Well:	ft
Well Volume:	liters
Depth to Top of Pump:	ft
Water Level After Sample:	<u>10.41</u> ft
Measurement Method:	<u>Electric Water Level Indicator</u>

SAMPLING INFORMATION	
Purging Method:	Bladder
Sampling Method:	Bladder
Dedicated Equipment?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Duplicate Sample ID:	<u>Dup 1</u>
Bottle List:	
1 Liter Raw	4- 1L Nitric
500mL Nitric	
500mL Nitric (filtered)	
250mL Sulfuric	
Control Settings:	
Purge:	<u>5</u> Sec.
Recover:	<u>75</u> Sec.
PSI:	<u>20</u>

FIELD READINGS

Stabilization Parameters (3 Consecutive)		Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate ml/Min	mL Removed	Appearance or Comment Clarity, Color, Odor, Ect.
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10					clear, slightly turbid, turbid
24 Apr 23	1412	Start of Well Purge									
	1417	9.56	1492	7.64	1.56	178.0	110.54	10.40	100.0	500.0	Clear
	1437	8.64	1266	7.66	0.46	177.8	65.12	10.40	100.0	200.0	Clear
	1442	8.75	1232	7.69	0.92	182.7	48.80	10.40	100.0	500.0	Clear
	1447	8.88	1225	7.66	0.96	185.6	44.8	10.40	100.0	500.0	Clear
	1452	8.98	1225	7.67	1.02	180.1	42.15	10.40	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 4000.0 ml

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment Clarity, Color, Odor, Ect.
24 Apr 23	1452	8.78	1225	7.67	42.15	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



Field Datasheet

Groundwater Assessment

2616 E. Broadway Ave, Bismarck, ND

Phone: (701) 258-9720

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 110
 Sampling Personal: [Signature]

Weather Conditions: Temp: 40 °F Wind: S @ 5-10 Precip: Sunny/ Partly Cloudy / Cloudy

WELL INFORMATION		
Well Locked?	YES	NO
Well Labeled?	<u>YES</u>	NO
Casing Strait?	YES	NO
Grout Seal Intact?	<u>YES</u>	NO
Repairs Necessary?	Not Visible	
Casing Diameter:	2"	
Water Level Before Purge:	8.91 ft	
Total Depth of Well:	16.85 ft	
Well Volume:	— liters	
Depth to Top of Pump:	— ft	
Water Level After Sample:	9.06 ft	
Measurement Method:	Electric Water Level Indicator	

SAMPLING INFORMATION		
Purging Method:	Bladder	
Sampling Method:	Bladder	
Dedicated Equipment?	<u>YES</u>	NO
Duplicate Sample?	YES	NO
Duplicate Sample ID:		
Bottle List:		
1 Liter Raw	4- 1L Nitric	
500mL Nitric		
500mL Nitric (filtered)		
250mL Sulfuric		

Control Settings:	
Purge:	5 Sec.
Recover:	5 Sec.
PSI:	20

FIELD READINGS

Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate ml/Min	mL Removed	Appearance or Comment Clarity, Color, Odor, Ect.	
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10				clear, slightly turbid, turbid	
24 Apr 23	0850	Start of Well Purge									
	0855	6.65	1079	7.70	3.04	193.7	75.27	9.01	100.0	500.0	Clear
	0910	6.87	1066	7.78	3.45	225.1	63.08	9.05	100.0	500.0	Clear
	0915	7.03	1066	7.74	3.44	227.1	44.44	9.06	100.0	500.0	Clear
	0920	7.18	1068	7.75	3.55	235.9	43.11	9.05	100.0	500.0	Clear
	0925	7.31	1065	7.75	3.58	230.6	44.63	9.06	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 3500.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment Clarity, Color, Odor, Ect.
24 Apr 23	0925	7.31	1065	7.75	44.63	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



Field Datasheet

2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Company: **MDU Lewis & Clark**
 Event: **Spring 2023**
 Sample ID: **119**
 Sampling Personal: **hch**

Weather Conditions: Temp: **45 °F** Wind: **E @ 10-13** Precip: **Sunny/ Partly Cloudy / Cloudy**

WELL INFORMATION		
Well Locked?	YES	NO
Well Labeled?	YES	NO
Casing Strait?	YES	NO
Grout Seal Intact?	YES	NO
Repairs Necessary?		Not Visible
Casing Diameter:	2"	
Water Level Before Purge:	8.74 ft	
Total Depth of Well:	ft	
Well Volume:	liters	
Depth to Top of Pump:	ft	
Water Level After Sample:	8.75 ft	
Measurement Method:	Electric Water Level Indicator	

SAMPLING INFORMATION		
Purging Method:	Bladder	Control Settings:
Sampling Method:	Bladder	Purge: 3 Sec.
Dedicated Equipment?	YES	NO
		Recover: 27 Sec.
		PSI: 20
Duplicate Sample?	YES	NO
Duplicate Sample ID:	-	
Bottle List:		
1 Liter Raw	4- 1L Nitric	
500mL Nitric		
500mL Nitric (filtered)		
250mL Sulfuric		

FIELD READINGS											
Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (ml/Min)	mL Removed	Appearance or Comment	
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10	(ft)	ml/Min		clear, slightly turbid, turbid	
24 Apr 23	1020	Start of Well Purge									
	1025	7.86	1019	7.67	2.12	218.1	108.44	8.75	100.0	500.0	Clear
	1040	7.95	1049	7.71	1.55	216.7	63.33	8.75	100.0	1500.0	Clear
	1045	8.04	1054	7.65	1.87	220.1	41.18	8.76	100.0	500.0	Clear
	1050	7.94	1043	7.64	1.74	213.6	17.77	8.76	100.0	500.0	Clear
	1055	7.80	1048	7.65	1.83	215.8	13.42	8.76	100.0	500.0	Clear

Well Stabilized? **YES** NO Total Volume Purged: **3500.0** ml

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
24 Apr 23	1055	7.80	1048	7.65	13.42	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 111
 Sampling Personal: J. Kelly

Weather Conditions: Temp: 35 °F Wind: N @ 5-10 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Well Labeled?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Casing Strait?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Grout Seal Intact?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> <i>Not Visible</i>
Repairs Necessary?	
Casing Diameter:	2"
Water Level Before Purge:	2.49 ft
Total Depth of Well:	ft
Well Volume:	liters
Depth to Top of Pump:	ft
Water Level After Sample:	ft
Measurement Method:	Electric Water Level Indicator

SAMPLING INFORMATION	
Purging Method:	Bladder
Sampling Method:	Bladder
Dedicated Equipment?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample ID:	
Bottle List:	
1 Liter Raw	4- 1L Nitric
500ml Nitric	
500ml Nitric (filtered)	
250ml Sulfuric	

Control Settings:	
Purge:	5 Sec.
Recover:	25 Sec.
PSI:	20

FIELD READINGS

Purge Date	Time	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (mL/Min)	mL Removed	Appearance or Comment
											Clarity, Color, Odor, Ect.
25 Apr 23	0633	Start of Well Purge									
	0638	5.48	3429	7.32	1.26	162.3	40.16	7.61	100.0	500.0	Clear
	0653	4.80	3498	7.48	3.96	141.7	18.17	7.60	100.0	1500.0	Clear
	0658	4.77	3431	7.58	4.17	136.7	9.80	7.60	100.0	500.0	Clear
	0703	4.73	3380	7.58	4.57	150.3	6.25	7.61	100.0	500.0	Clear
	0708	4.73	3436	7.54	4.62	143.6	2.74	7.61	100.0	500.0	Clear
	0713	4.69	3468	7.52	4.55	141.7	1.24	7.61	100.0	500.0	Clear

Well Stabilized? YES NO Total Volume Purged: 4000.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
25 Apr 23	0713	4.69	3468	7.52	1.24	Clear

Comments: Collected field blank @ 0640

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: **MDU Lewis & Clark**
 Event: **Spring 2023**
 Sample ID: **117**
 Sampling Personal: **[Signature]**

Weather Conditions: Temp: **50°F** Wind: **E @ 10-15** Precip: **Sunny / Partly Cloudy / Cloudy**

WELL INFORMATION	
Well Locked?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Well Labeled?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Casing Strait?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Grout Seal Intact?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> Not Visible
Repairs Necessary?	
Casing Diameter:	2"
Water Level Before Purge:	5.00 ft
Total Depth of Well:	11.50 ft
Well Volume:	4.0 liters
Depth to Top of Pump:	9.01 ft
Water Level After Sample:	Below Pump ft
Measurement Method:	Electric Water Level Indicator

SAMPLING INFORMATION	
Purging Method:	Bladder
Sampling Method:	Bladder
Dedicated Equipment?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Duplicate Sample?	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
Duplicate Sample ID:	
Bottle List:	
1 Liter Raw	4- 1L Nitric
500mL Nitric	
500mL Nitric (filtered)	
250mL Sulfuric	

Control Settings:	
Purge:	5 Sec.
Recover:	25 Sec.
PSI:	20

FIELD READINGS

Stabilization Parameters (3 Consecutive)		Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (mL/Min)	mL Removed	Appearance or Comment
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10					Clarity, Color, Odor, Ect.
24 Apr 23	1312	Start of Well Purge									
	1317	7.09	5884	7.49	5.89	232.7	6.17	6.55	100.0	500.0	Clear
	1322	7.11	5915	7.50	5.86	238.3	4.82	6.97	100.0	500.0	Clear
	1337	6.99	5981	7.53	6.38	179.4	10.17	7.46	100.0	1500.0	Clear
	1342	7.05	5971	7.54	6.49	176.0	8.12	7.84	100.0	500.0	Clear
	1347	6.75	6000	7.52	6.39	184.2	4.98	8.23	100.0	500.0	Clear

Well Stabilized? **YES** **NO** Total Volume Purged: **3500.0** mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
24 Apr 23	1347	6.75	6000	7.52	4.98	Clear

Comments:

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Report Date: Friday, May 5, 2023 3:42:28 PM



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 1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
 www.MVTL.com



Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: **MDU Lewis & Clark**
 Event: **Spring 2023**
 Sample ID: **118**
 Sampling Personal: **J. Clark**

Weather Conditions: Temp: **35 °F** Wind: **N @ 5-10** Precip: **Sunny / Partly Cloudy / Cloudy**

WELL INFORMATION		
Well Locked?	YES	(NO)
Well Labeled?	YES	NO
Casing Strait?	YES	NO
Grout Seal Intact?	YES	NO
Repairs Necessary?	YES	NO
Casing Diameter:	2"	
Water Level Before Purge:	8.15 ft	
Total Depth of Well:	-	
Well Volume:	-	
Depth to Top of Pump:	-	
Water Level After Sample:	8.22 ft	
Measurement Method:	Electric Water Level Indicator	

SAMPLING INFORMATION		
Purging Method:	Bladder	
Sampling Method:	Bladder	
Dedicated Equipment?	YES	(NO)
Duplicate Sample?	YES	(NO)
Duplicate Sample ID:	-	
Bottle List:		
1 Liter Raw	4- 1L Nitric	
500mL Nitric		
500mL Nitric (filtered)		
250mL Sulfuric		
Control Settings:		
Purge:	5	Sec.
Recover:	25	Sec.
PSI:	20	

FIELD READINGS

Stabilization Parameters (3 Consecutive)	Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate mL/Min	mL Removed	Appearance or Comment Clarity, Color, Odor, Ect.
Purge Date	Time	±0.5*	±5%	±0.1	±10%	±10				clear, slightly turbid, turbid
25 Apr 23	0746	Start of Well Purge								
	0757	5.72	1579	7.70	2.07	170.9	8.24	100.0	500.0	Slightly Turbid
	0806	5.59	1576	7.74	1.76	111.4	8.21	100.0	1500.0	Clear
	0811	5.67	1575	7.77	1.99	110.9	8.22	100.0	500.0	Clear
	0816	5.66	1568	7.75	1.87	117.7	8.22	100.0	500.0	Clear
	0821	5.72	1571	7.75	1.78	115.6	8.22	100.0	500.0	Clear

Well Stabilized? **YES** NO Total Volume Purged: **3500.0** mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment Clarity, Color, Odor, Ect.
25 Apr 23	0821	5.72	1571	7.75	1.36	Clear

Comments:

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck



2616 E. Broadway Ave, Bismarck, ND
 Phone: (701) 258-9720

Field Datasheet

Groundwater Assessment

Company: MDU Lewis & Clark
 Event: Spring 2023
 Sample ID: 120
 Sampling Personal: J. Kelly

Weather Conditions: Temp: 50 °F Wind: E @ 10-15 Precip: Sunny / Partly Cloudy / Cloudy

WELL INFORMATION	
Well Locked?	YES (NO)
Well Labeled?	YES (NO)
Casing Strait?	YES (NO)
Grout Seal Intact?	YES (NO) (Not Visible)
Repairs Necessary?	
Casing Diameter:	2" ft
Water Level Before Purge:	14.81 ft
Total Depth of Well:	18.88 ft
Well Volume:	2.5 liters
Depth to Top of Pump:	ft
Water Level After Sample:	15.32 ft
Measurement Method:	Electric Water Level Indicator

SAMPLING INFORMATION		Control Settings:	
Purging Method:	Bladder	Purge:	3 Sec.
Sampling Method:	Bladder	Recover:	7 Sec.
Dedicated Equipment?	YES (NO)	PSI:	20
Duplicate Sample?	YES (NO)		
Duplicate Sample ID:			
Bottle List:			
1 Liter Raw	4- 1L Nitric		
500mL Nitric			
500mL Nitric (filtered)			
250mL Sulfuric			

FIELD READINGS

Stabilization Parameters (3 Consecutive)		Temp. (°C)	Spec. Cond.	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Water Level (ft)	Pumping Rate (mL/Min)	mL Removed	Appearance or Comment
Purge Date	Time	±0.5°	±5%	±0.1	±10%	±10		(ft)			Clarity, Color, Odor, Ect.
24 Apr 23	1155	Start of Well Purge									
	1200	8.26	5505	6.96	0.95	173.4	3.02	15.06	100.0	500.0	Clear
	1215	7.75	5443	6.97	0.99	140.4	0.35	15.24	100.0	500.0	Clear
	1220	7.71	5579	6.97	1.14	152.3	0.34	15.26	100.0	500.0	Clear
	1225	7.62	5665	6.97	1.02	160.3	0.31	15.27	100.0	500.0	Clear
	1230	7.69	5786	6.95	1.06	168.2	0.26	15.29	100.0	500.0	Clear

Well Stabilized? YES (NO) Total Volume Purged: 3500.0 mL

Sample Date	Time	Temp. (°C)	Spec. Cond.	pH	Turbidity (NTU)	Appearance or Comment
Clarity, Color, Odor, Ect.						
24 Apr 23	1230	7.69	5786	6.95	0.26	Clear

Comments:

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Original Sample ID	QC Type	Analyte	Analysis Date	QC Result	Original Sample Re	Units	Spike Amount	Spike Resu	Spike % Recovr	Spike Duplicate	Spike Duplicate	RPD (%)	Lower Control Limi	Upper Control Limi	RPD Limit (%)
13560001	MS	Antimony	05/03/2023 16:30:54	101	<0.001	mg/L	0.4	0.404	101				75	125	
13560001	MSD	Antimony	05/03/2023 16:35:01	98.9	<0.001	mg/L				0.396	98.9	2.00	75	125	20
13601001	MS	Antimony	05/04/2023 14:12:00	99.9		mg/L	0.4	0.403	99.9				70	130	
13601001	MSD	Antimony	05/04/2023 14:16:00	100		mg/L				0.404	100	0.25	70	130	20
	LFB-MS	Antimony	05/04/2023 13:43:00	98.4		mg/L	0.1	0.0984	98.4				85	115	
	LFB-MS	Antimony	05/03/2023 16:18:35	101		mg/L	0.1	0.101	101				80	120	
	MB	Antimony	05/04/2023 13:39:00	<0.001		mg/L									
	MB	Antimony	05/03/2023 16:14:28	<0.001		mg/L									
13560001	MS	Arsenic	05/03/2023 16:30:54	100	<0.002	mg/L	0.4	0.4	100				75	125	
13560001	MSD	Arsenic	05/03/2023 16:35:01	107	<0.002	mg/L				0.43	107	7.23	75	125	20
	LFB-MS	Arsenic	05/03/2023 16:18:35	102		mg/L	0.1	0.102	102				80	120	
	MB	Arsenic	05/03/2023 16:14:28	<0.002		mg/L									
13560001	MS	Barium	05/03/2023 16:30:54	94.7	0.0330	mg/L	0.4	0.412	94.7				75	125	
13560001	MSD	Barium	05/03/2023 16:35:01	93.6	0.0330	mg/L				0.407	93.6	1.22	75	125	20
13601001	MS	Barium	05/04/2023 14:12:00	82.7		mg/L	0.4	0.331	82.7				70	130	
13601001	MSD	Barium	05/04/2023 14:16:00	82.3		mg/L				0.329	82.3	0.61	70	130	20
	LFB-MS	Barium	05/03/2023 16:18:35	96.8		mg/L	0.1	0.0968	96.8				80	120	
	MB	Barium	05/04/2023 13:39:00	<0.002		mg/L									
	MB	Barium	05/03/2023 16:14:28	<0.002		mg/L									
13560001	MS	Beryllium	05/03/2023 16:30:54	109	<0.0005	mg/L	0.4	0.436	109				75	125	
13560001	MSD	Beryllium	05/03/2023 16:35:01	117	<0.0005	mg/L				0.467	117	6.87	75	125	20
13601001	MS	Beryllium	05/04/2023 14:12:00	107		mg/L	0.4	0.428	107				70	130	
13601001	MSD	Beryllium	05/04/2023 14:16:00	107		mg/L				0.427	107	0.23	70	130	20
	LFB-MS	Beryllium	05/03/2023 16:18:35	110		mg/L	0.1	0.11	110				80	120	
	LFB-MS	Beryllium	05/04/2023 13:43:00	101		mg/L	0.1	0.101	101				85	115	
	MB	Beryllium	05/04/2023 13:39:00	<0.0005		mg/L									
	MB	Beryllium	05/03/2023 16:14:28	<0.0005		mg/L									
13560001	MS	Cadmium	05/03/2023 16:30:54	96.7	<0.0005	mg/L	0.4	0.387	96.7				75	125	
13560001	MSD	Cadmium	05/03/2023 16:35:01	99.2	<0.0005	mg/L				0.397	99.2	2.55	75	125	20
13601001	MS	Cadmium	05/04/2023 14:12:00	92.7	<0.001	mg/L	0.4	0.371	92.7				70	130	
13601001	MSD	Cadmium	05/04/2023 14:16:00	94.2	<0.001	mg/L				0.377	94.2	1.60	70	130	20
	LFB-MS	Cadmium	05/03/2023 16:18:35	102		mg/L	0.1	0.102	102				80	120	
	LFB-MS	Cadmium	05/04/2023 13:43:00	96.2		mg/L	0.1	0.0962	96.2				85	115	
	MB	Cadmium	05/03/2023 16:14:28	<0.0005		mg/L									
	MB	Cadmium	05/04/2023 13:39:00	<0.0005		mg/L									
13560001	MS	Chromium	05/03/2023 16:30:54	104	<0.002	mg/L	0.4	0.414	104				75	125	
13560001	MSD	Chromium	05/03/2023 16:35:01	109	<0.002	mg/L				0.438	109	5.63	75	125	20
13601001	MS	Chromium	05/04/2023 14:12:00	101	<0.05	mg/L	0.4	0.406	101				70	130	
13601001	MSD	Chromium	05/04/2023 14:16:00	98.7	<0.05	mg/L				0.395	98.7	2.75	70	130	20
	LFB-MS	Chromium	05/04/2023 13:43:00	97.2		mg/L	0.1	0.0972	97.2				85	115	
	LFB-MS	Chromium	05/03/2023 16:18:35	106		mg/L	0.1	0.106	106				80	120	
	MB	Chromium	05/04/2023 13:39:00	<0.002		mg/L									
	MB	Chromium	05/03/2023 16:14:28	<0.002		mg/L									
13560001	MS	Cobalt	05/03/2023 16:30:54	103	<0.002	mg/L	0.4	0.412	103				75	125	
13560001	MSD	Cobalt	05/03/2023 16:35:01	108	<0.002	mg/L				0.431	108	4.51	75	125	20
13601001	MS	Cobalt	05/04/2023 14:12:00	99.9		mg/L	0.4	0.4	99.9				70	130	
13601001	MSD	Cobalt	05/04/2023 14:16:00	98.3		mg/L				0.393	98.3	1.76	70	130	20
	LFB-MS	Cobalt	05/04/2023 13:43:00	96.8		mg/L	0.1	0.0968	96.8				85	115	
	LFB-MS	Cobalt	05/03/2023 16:18:35	105		mg/L	0.1	0.105	105				80	120	
	MB	Cobalt	05/04/2023 13:39:00	<0.002		mg/L									
	MB	Cobalt	05/03/2023 16:14:28	<0.002		mg/L									
13560001	MS	Lead	05/03/2023 16:30:54	96.4	<0.0005	mg/L	0.4	0.386	96.4				75	125	
13560001	MSD	Lead	05/03/2023 16:35:01	98.4	<0.0005	mg/L				0.393	98.4	1.80	75	125	20
13601001	MS	Lead	05/04/2023 14:12:00	96.7	<0.001	mg/L	0.4	0.387	96.7				70	130	
13601001	MSD	Lead	05/04/2023 14:16:00	95.2	<0.001	mg/L				0.381	95.2	1.56	70	130	20
	LFB-MS	Lead	05/04/2023 13:43:00	99.7		mg/L	0.1	0.0997	99.7				85	115	
	LFB-MS	Lead	05/03/2023 16:18:35	99		mg/L	0.1	0.099	99				80	120	



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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Workorder Summary

Workorder Comments

All analytes with dilution factors greater than 1 (displayed in DF column) required dilution due to matrix or high concentration of target analyte unless otherwise noted and reporting limits (RDL column) have been adjusted accordingly.

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Report Date: Wednesday, May 24, 2023 11:21:03 AM

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567001 **Date Collected:** 04/24/2023 14:52 **Matrix:** Groundwater
Sample ID: MW103 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:05	05/23/2023 15:05	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567002 **Date Collected:** 04/24/2023 09:25 **Matrix:** Groundwater
Sample ID: MW110 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567003 **Date Collected:** 04/24/2023 10:55 **Matrix:** Groundwater
Sample ID: MW119 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

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Report Date: Wednesday, May 24, 2023 11:21:03 AM



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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567004 **Date Collected:** 04/25/2023 07:13 **Matrix:** Groundwater
Sample ID: MW111 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567005 **Date Collected:** 04/24/2023 13:47 **Matrix:** Groundwater
Sample ID: MW117 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

MVTL guarantees the accuracy of the analysis done on the sample submitted for testing. It is not possible for MVTL to guarantee that a test result obtained on a particular sample will be the same on any other sample unless all conditions affecting the sample are the same, including sampling by MVTL. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Report Date: Wednesday, May 24, 2023 11:21:03 AM



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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567006 **Date Collected:** 04/25/2023 08:21 **Matrix:** Groundwater
Sample ID: MW118 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567007 **Date Collected:** 04/24/2023 12:30 **Matrix:** Groundwater
Sample ID: MW120 **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	
Radium 228	See Attached			1	05/23/2023 15:06	05/23/2023 15:06	SUB1	

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Account #: 2800

Client: Montana-Dakota Utilities - Bismarck

Analytical Results

Lab ID: 13567009 **Date Collected:** 04/25/2023 06:40 **Matrix:** Groundwater
Sample ID: Field Blank (FB) **Date Received:** 04/26/2023 08:00 **Collector:** MVTL Field Service

Temp @ Receipt (C): 8.6

Contract Lab

Method: Contracted Result

Parameter	Results	Units	RDL	DF	Prepared	Analyzed	By	Qual
Radium 226	See			1	05/23/2023	05/23/2023	SUB1	
	Attached				15:06	15:06		
Radium 228	See			1	05/23/2023	05/23/2023	SUB1	
	Attached				15:06	15:06		

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ANALYTICAL SUMMARY REPORT

May 22, 2023

Minnesota Valley Testing Laboratories
1126 N Front St
New Ulm, MN 56073-1176

Work Order: C23040892 Quote ID: C15480

Project Name: 13567

Energy Laboratories, Inc. Casper WY received the following 9 samples for Minnesota Valley Testing Laboratories on 4/28/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C23040892-001	13567001;MW103	04/24/23 14:52	04/28/23	Groundwater	Radium 226 + Radium 228, Total Radium 226, Total Radium 228, Total
C23040892-002	13567002;MW110	04/24/23 9:25	04/28/23	Groundwater	Same As Above
C23040892-003	1356003;MW119	04/24/23 10:55	04/28/23	Groundwater	Same As Above
C23040892-004	13567004;MW111	04/25/23 7:13	04/28/23	Groundwater	Same As Above
C23040892-005	13567005;MW117	04/24/23 13:47	04/28/23	Groundwater	Same As Above
C23040892-006	13567006;MW118	04/25/23 8:21	04/28/23	Groundwater	Same As Above
C23040892-007	13567007;MW120	04/24/23 12:30	04/28/23	Groundwater	Same As Above
C23040892-008	13567008;Dup 1	04/24/23 14:52	04/28/23	Groundwater	Same As Above
C23040892-009	13567009; Field Blank	04/25/23 6:40	04/28/23	Groundwater	Same As Above

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Michele L. Davis
Digitally signed by Michele L. Davis
Date: 2023.05.22 15:13:59 -06:00

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-001
Client Sample ID: 13567001;MW103

Report Date: 05/22/23
Collection Date: 04/24/23 14:52
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	0.2	pCi/L	U		E903.0		05/17/23 15:50 / kdk
Radium 226 precision (±)	0.2	pCi/L			E903.0		05/17/23 15:50 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/17/23 15:50 / kdk
Radium 228	0.04	pCi/L	U		RA-05		05/08/23 13:21 / trs
Radium 228 precision (±)	0.8	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 228 MDC	1.3	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 226 + Radium 228	0.8	pCi/L	U		A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 precision (±)	0.8	pCi/L			A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 MDC	1.4	pCi/L			A7500-RA		05/19/23 12:44 / dmf

Report Definitions:

RL - Analyte Reporting Limit	MCL - Maximum Contaminant Level
QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-002
Client Sample ID: 13567002;MW110

Report Date: 05/22/23
Collection Date: 04/24/23 09:25
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	0.03	pCi/L	U		E903.0		05/18/23 08:34 / kdk
Radium 226 precision (±)	0.04	pCi/L			E903.0		05/18/23 08:34 / kdk
Radium 226 MDC	0.06	pCi/L			E903.0		05/18/23 08:34 / kdk
Radium 228	-0.6	pCi/L	U		RA-05		05/08/23 13:21 / trs
Radium 228 precision (±)	0.8	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 228 MDC	1.4	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 226 + Radium 228	0.7	pCi/L	U		A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 precision (±)	0.8	pCi/L			A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 MDC	1.4	pCi/L			A7500-RA		05/19/23 12:44 / dmf

Report Definitions:

RL - Analyte Reporting Limit	MCL - Maximum Contaminant Level
QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-003
Client Sample ID: 1356003;MW119

Report Date: 05/22/23
Collection Date: 04/24/23 10:55
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	0.004	pCi/L	U		E903.0		05/18/23 08:34 / kdk
Radium 226 precision (±)	0.04	pCi/L			E903.0		05/18/23 08:34 / kdk
Radium 226 MDC	0.07	pCi/L			E903.0		05/18/23 08:34 / kdk
Radium 228	-0.6	pCi/L	U		RA-05		05/08/23 13:21 / trs
Radium 228 precision (±)	0.8	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 228 MDC	1.4	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 226 + Radium 228	0.7	pCi/L	U		A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 precision (±)	0.8	pCi/L			A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 MDC	1.4	pCi/L			A7500-RA		05/19/23 12:44 / dmf

Report Definitions:

RL - Analyte Reporting Limit	MCL - Maximum Contaminant Level
QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-004
Client Sample ID: 13567004;MW111

Report Date: 05/22/23
Collection Date: 04/25/23 07:13
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	0.09	pCi/L	U		E903.0		05/18/23 11:10 / kdk
Radium 226 precision (±)	0.1	pCi/L			E903.0		05/18/23 11:10 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/18/23 11:10 / kdk
Radium 228	0.08	pCi/L	U		RA-05		05/08/23 13:21 / trs
Radium 228 precision (±)	0.7	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 228 MDC	1.2	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 226 + Radium 228	0.7	pCi/L	U		A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 precision (±)	0.8	pCi/L			A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 MDC	1.3	pCi/L			A7500-RA		05/19/23 12:44 / dmf

Report Definitions:

RL - Analyte Reporting Limit	MCL - Maximum Contaminant Level
QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-005
Client Sample ID: 13567005;MW117

Report Date: 05/22/23
Collection Date: 04/24/23 13:47
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L			E903.0		05/18/23 11:10 / kdk
Radium 226 precision (±)	0.2	pCi/L			E903.0		05/18/23 11:10 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/18/23 11:10 / kdk
Radium 228	1.2	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 228 precision (±)	0.6	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 228 MDC	1.2	pCi/L			RA-05		05/08/23 13:21 / trs
Radium 226 + Radium 228	1.5	pCi/L			A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 precision (±)	0.7	pCi/L			A7500-RA		05/19/23 12:44 / dmf
Radium 226 + Radium 228 MDC	1.2	pCi/L			A7500-RA		05/19/23 12:44 / dmf

Report Definitions: RL - Analyte Reporting Limit
QCL - Quality Control Limit

MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-006
Client Sample ID: 13567006;MW118

Report Date: 05/22/23
Collection Date: 04/25/23 08:21
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	-0.08	pCi/L	U		E903.0		05/16/23 11:36 / kdk
Radium 226 precision (±)	0.1	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 228	0.2	pCi/L	U		RA-05		05/09/23 15:25 / trs
Radium 228 precision (±)	0.9	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 228 MDC	1.5	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 226 + Radium 228	0.9	pCi/L	U		A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 precision (±)	0.9	pCi/L			A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 MDC	1.5	pCi/L			A7500-RA		05/17/23 14:44 / dmf

Report Definitions:

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QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-007
Client Sample ID: 13567007;MW120

Report Date: 05/22/23
Collection Date: 04/24/23 12:30
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	-0.02	pCi/L	U		E903.0		05/16/23 11:36 / kdk
Radium 226 precision (±)	0.1	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 228	-0.2	pCi/L	U		RA-05		05/09/23 15:25 / trs
Radium 228 precision (±)	0.8	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 228 MDC	1.4	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 226 + Radium 228	0.8	pCi/L	U		A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 precision (±)	0.9	pCi/L			A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 MDC	1.5	pCi/L			A7500-RA		05/17/23 14:44 / dmf

Report Definitions:

RL - Analyte Reporting Limit	MCL - Maximum Contaminant Level
QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-008
Client Sample ID: 13567008;Dup 1

Report Date: 05/22/23
Collection Date: 04/24/23 14:52
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	0.2	pCi/L	U		E903.0		05/16/23 11:36 / kdk
Radium 226 precision (±)	0.2	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 228	0.2	pCi/L	U		RA-05		05/09/23 15:25 / trs
Radium 228 precision (±)	0.9	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 228 MDC	1.5	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 226 + Radium 228	0.9	pCi/L	U		A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 precision (±)	0.9	pCi/L			A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 MDC	1.6	pCi/L			A7500-RA		05/17/23 14:44 / dmf

Report Definitions:

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QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
U - Not detected at Minimum Detectable Concentration (MDC)	

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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories
Project: 13567
Lab ID: C23040892-009
Client Sample ID: 13567009; Field Blank

Report Date: 05/22/23
Collection Date: 04/25/23 06:40
Date Received: 04/28/23
Matrix: Groundwater

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226	-0.03	pCi/L	U		E903.0		05/16/23 11:36 / kdk
Radium 226 precision (±)	0.1	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 226 MDC	0.2	pCi/L			E903.0		05/16/23 11:36 / kdk
Radium 228	0.4	pCi/L	U		RA-05		05/09/23 15:25 / trs
Radium 228 precision (±)	0.9	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 228 MDC	1.5	pCi/L			RA-05		05/09/23 15:25 / trs
Radium 226 + Radium 228	0.9	pCi/L	U		A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 precision (±)	0.9	pCi/L			A7500-RA		05/17/23 14:44 / dmf
Radium 226 + Radium 228 MDC	1.5	pCi/L			A7500-RA		05/17/23 14:44 / dmf

Report Definitions:

- RL - Analyte Reporting Limit
- QCL - Quality Control Limit
- U - Not detected at Minimum Detectable Concentration (MDC)
- MCL - Maximum Contaminant Level
- ND - Not detected at the Reporting Limit (RL)

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories

Work Order: C23040892

Report Date: 05/19/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0 Batch: RA226-10881										
Lab ID: LCS-RA226-10881	3	Laboratory Control Sample								
							Run: G5000W_230502A			05/16/23 11:35
Radium 226		9.2	pCi/L	92		70	130			
Radium 226 precision (±)		1.8	pCi/L							
Radium 226 MDC		0.24	pCi/L							
Lab ID: MB-RA226-10881	3	Method Blank					Run: G5000W_230502A			05/16/23 11:36
Radium 226		-0.1	pCi/L							U
Radium 226 precision (±)		0.1	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C23040902-001CDUP	3	Sample Duplicate					Run: G5000W_230502A			05/16/23 13:08
Radium 226		0.44	pCi/L					16	30	
Radium 226 precision (±)		0.19	pCi/L							
Radium 226 MDC		0.24	pCi/L							
- The RER result is 0.28.										
Method: E903.0 Batch: RA226-10880R										
Lab ID: LCS-RA226-10880	3	Laboratory Control Sample					Run: G5000W_230502B			05/17/23 12:50
Radium 226		7.0	pCi/L	70		70	130			
Radium 226 precision (±)		1.4	pCi/L							
Radium 226 MDC		0.23	pCi/L							
Lab ID: MB-RA226-10880	3	Method Blank					Run: G5000W_230502B			05/17/23 12:50
Radium 226		-0.03	pCi/L							U
Radium 226 precision (±)		0.1	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C23040647-022CDUP	3	Sample Duplicate					Run: G5000W_230502B			05/17/23 12:50
Radium 226		0.16	pCi/L					120	30	UR
Radium 226 precision (±)		0.14	pCi/L							
Radium 226 MDC		0.20	pCi/L							
- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than or equal to the limit of 3, the RER result is 0.62.										
Lab ID: C23030711-009ADUP	3	Sample Duplicate					Run: G5000W_230502B			05/18/23 08:34
Radium 226		8.9	pCi/L					55	30	R
Radium 226 precision (±)		2.8	pCi/L							
Radium 226 MDC		6.3	pCi/L							
- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than or equal to the limit of 3, the RER result is 1.02.										

Qualifiers:

RL - Analyte Reporting Limit

R - Relative Percent Difference (RPD) exceeds advisory limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Minnesota Valley Testing Laboratories

Work Order: C23040892

Report Date: 05/19/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05 Batch: RA228-7085										
Lab ID: LCS-228-RA226-10881	3	Laboratory Control Sample								
		Run: TENNELEC-3_230502B								05/09/23 15:25
Radium 228		5.3	pCi/L	75		70	130			
Radium 228 precision (±)		1.5	pCi/L							
Radium 228 MDC		1.5	pCi/L							
Lab ID: MB-RA226-10881	3	Method Blank								
		Run: TENNELEC-3_230502B								05/09/23 15:25
Radium 228		0.6	pCi/L							U
Radium 228 precision (±)		0.9	pCi/L							
Radium 228 MDC		2	pCi/L							
Lab ID: C23040902-001CDUP	3	Sample Duplicate								
		Run: TENNELEC-3_230502B								05/09/23 15:25
Radium 228		0.34	pCi/L					80	30	UR
Radium 228 precision (±)		0.92	pCi/L							
Radium 228 MDC		1.5	pCi/L							
- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than or equal to the limit of 3, the RER result is 0.15.										
Method: RA-05 Batch: RA228-7084										
Lab ID: LCS-228-RA226-10880	3	Laboratory Control Sample								
		Run: TENNELEC-4_230502B								05/08/23 11:42
Radium 228		6.6	pCi/L	94		70	130			
Radium 228 precision (±)		1.4	pCi/L							
Radium 228 MDC		1.1	pCi/L							
Lab ID: MB-RA226-10880	3	Method Blank								
		Run: TENNELEC-4_230502B								05/08/23 11:42
Radium 228		0.8	pCi/L							U
Radium 228 precision (±)		0.6	pCi/L							
Radium 228 MDC		1	pCi/L							
Lab ID: C23040647-022CDUP	3	Sample Duplicate								
		Run: TENNELEC-4_230502B								05/08/23 11:42
Radium 228		0.52	pCi/L					100	30	UR
Radium 228 precision (±)		0.65	pCi/L							
Radium 228 MDC		1.0	pCi/L							
- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than or equal to the limit of 3, the RER result is 0.40.										
Lab ID: C23030711-009ADUP	3	Sample Duplicate								
		Run: TENNELEC-4_230502B								05/08/23 13:49
Radium 228		41	pCi/L					54	30	UR
Radium 228 precision (±)		57	pCi/L							
Radium 228 MDC		97	pCi/L							
- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than or equal to the limit of 3, the RER result is 0.26.										

Qualifiers:

RL - Analyte Reporting Limit

R - Relative Percent Difference (RPD) exceeds advisory limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

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Work Order Receipt Checklist

Minnesota Valley Testing Laboratories

C23040892

Login completed by: Hannah R. Johnson

Date Received: 4/28/2023

Reviewed by: cjohnson

Received by: sjf

Reviewed Date: 5/1/2023

Carrier name: UPS

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on all shipping container(s)/cooler(s)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on all sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Not Applicable <input type="checkbox"/>
Container/Temp Blank temperature:	9.7°C No Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Applicable <input type="checkbox"/>

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as -dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

None

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Chain of Custody Record



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 Bismarck, ND 58501

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 Toll Free: (800) 279-6885 Fax: (701) 258-9724

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WO #13567

Company Name and Address:				Account #:		Phone #:					
MVTL 2616 E Broadway Bismarck, ND 58501						701-258-9720					
Billing Address (indicate if different from above):				Contact:		Fax #:					
PO Box 249 New Ulm, MN 56073				Claudette		For faxed report check box <input type="checkbox"/> For e-mail report check box <input type="checkbox"/>					
				Name of Sampler:		E-mail:					
						ccarroll@mvtl.com					
				Quote Number		Date Submitted:					
						26-Apr-23					
				Project Name/Number:		Purchase Order #:					
						BL6542					
Sample Information						Bottle Type					Analysis
IML Lab Number	MVTL Lab Number	Client Sample ID	Sample Type	Date Sampled	Time Sampled	Untreated	1000 ml HNO3	VOC Vials Impreserved	Glass Jar	Other	Analysis Required
	13567001	MW103	GW	24-Apr-23	1452		4				Ra226 & Ra228
	13567002	MW110	GW	24-Apr-23	0925		4				Ra226 & Ra228
	13567003	MW119	GW	24-Apr-23	1055		4				Ra226 & Ra228
	13567004	MW111	GW	25-Apr-23	0713		4				Ra226 & Ra228
	13567005	MW117	GW	24-Apr-23	1347		4				Ra226 & Ra228
	13567006	MW118	GW	25-Apr-23	0821		4				Ra226 & Ra228
	13567007	MW120	GW	24-Apr-23	1230		4				Ra226 & Ra228
	13567008	Dup 1	GW	24-Apr-23	1452		4				Ra226 & Ra228
	13567009	Field Blank	GW	25-Apr-23	0640		4				Ra226 & Ra228
All results must be reported as a numerical value											
Transferred by:			Date:	Time:	Sample Condition:	Received by:		Date:	Temp:		
T. Olson			26-Apr-23	1700		<i>Selena Jensen</i>		4/28/23	11:11	9.7	
2.											

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Appendix B

Alternative Source Demonstrations – Scrubber Ponds



Alternative Source Demonstration (ASD) for Lithium, Fall 2022

Lewis & Clark Station

Prepared for
Montana-Dakota Utilities Co.

March 2023

Alternative Source Demonstration (ASD) for Lithium, Fall 2022 Lewis & Clark Station

March 2023

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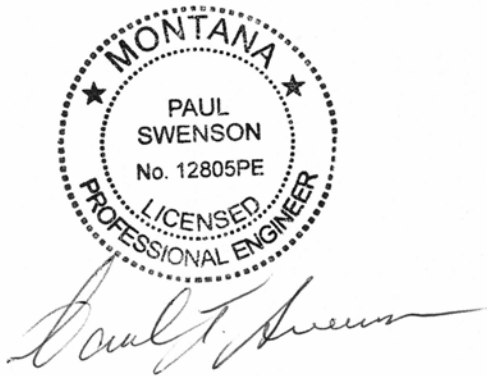
Figure 1	Site Layout
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List of Appendices

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Appendix B	Analytical Results

Certifications

I hereby certify that the written demonstration provided herein, supported by the data in the referenced documents, is accurate and consistent with our review of the groundwater and other data collected to date, as required under the CCR Rule (§257.95(g)(3)(ii)). Based on this review I have determined that a source other than the CCR unit regulated under the CCR Rule at the Site caused the statistically significant increases over the applicable groundwater protection standards (GWPS) for lithium in wells that are downgradient from that unit.



Paul Swenson, P.E.
PE #: 12805PE

March 8, 2023
Date

1 Introduction

Montana-Dakota Utilities Co. (MDU) operated a coal-fired electrical generation plant at the Lewis & Clark Station (Site) near Sidney, Montana. Operation of the plant resulted in coal combustion residuals (CCR) as a by-product. Management of CCR at the Site was subject to regulation under 40 CFR Part 257, Disposal of Coal Combustion Residuals From Electric Utilities (the CCR Rule).

Since the 1970s, CCR has been managed at the Site at various CCR management facilities. In particular:

- In 1975, two unlined surface impoundments were constructed on the Site. Based on available historical data, it appears that construction of the ponds involved excavating materials down to the Ft. Union Formation (Barr, 2016; Barr, 2019b), meaning that the sides of the surface impoundments were likely in direct contact with the aquifer. These surface impoundments were closed before the CCR Rule was promulgated, and therefore are not regulated under the CCR Rule.
- In 1993, clay-lined scrubber ponds were constructed generally in the footprint of the unlined surface impoundments, described above, with base elevations that were higher than the base elevations of the former surface impoundments. Once these scrubber ponds became operational, MDU started placing solid materials from them on top of a temporary storage pad (TSP) at the Site. In particular, the TSP stored flue-gas desulfurization (FGD) solids (excavated from the scrubber ponds) where it drained prior to loading and hauling for off-site disposal. The locations of these former scrubber ponds and former TSP are shown on Figure 1. These ponds were in existence on the effective date of the CCR Rule. Throughout this report, they are referred to as the “former Scrubber Ponds.”
- In 1998, the TSP was retrofitted with a geomembrane liner.
- In 2018, the former Scrubber Ponds were retrofitted with a composite liner with a small lateral expansion of each pond to the northeast, with base elevations that were higher than the original 1993 construction.
- In 2020, the lined TSP was closed using the closure-by-removal method after the Alternative Source Demonstration (ASD), Temporary Storage Pad, Lewis & Clark Station (Barr, 2020a) was completed. The current TSP is not regulated by the CCR Rule.
- In 2022, closure construction was completed on the lined Scrubber Ponds. Closure construction included removal of CCR from the ponds, removal of liner materials, filling the excavation with soil, and regrading the area to drain. The unregulated TSP was also removed in 2022.

The currently regulated CCR unit is the former Scrubber Ponds, a single, multi-unit CCR surface impoundment. The closed TSP is a former regulated CCR unit.

Statistically significant increases of appendix III parameters were detected under the detection monitoring program and the site transitioned to assessment monitoring on April 14, 2018. A determination was made on January 2, 2019, that selenium and lithium were detected in downgradient wells at statistically significant levels above groundwater protection standards (GWPS). An assessment of corrective measures was initiated on April 2, 2019. A downward trend in selenium concentrations was observed in monitoring results. Selenium has not been detected at statistically significant levels above GWPS since April 2020. MDU continued to pursue an ASD for these constituents in parallel with ongoing corrective action measures. A successful ASD was published in January 2021 addressing both lithium and selenium. Each monitoring event since has been evaluated under the same approach as was used for the 2020 ASD, but recent ASDs have not evaluated selenium as it is no longer measured at statistically significant levels above GWPS. This ASD has been prepared for the results obtained during the Fall 2022 monitoring event.

1.1 Purpose

Detection monitoring conducted as required by the CCR Rule documented statistically significant increases (SSIs) over background levels for appendix III parameters. In accordance with the CCR Rule, assessment monitoring was undertaken at the Site, which identified concentrations of lithium in downgradient wells that potentially result in SSIs over background levels for the fall 2022 monitoring event. According to the CCR Rule, Section § 257.94(e)(2):

The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

This report provides written documentation of an Alternative Source Demonstration (ASD) supporting continuation of assessment monitoring in accordance with § 257.95(g)(3)(ii) of the CCR Rule.

An ASD was prepared in January 2021 (Appendix C of the 2020 Annual Groundwater Monitoring and Corrective Action Report (Barr, 2021)), ending the selection of remedy phase of remediation activities for the Site. Data collected during the fall assessment monitoring event in August 2022 (Table 1) have been reviewed and an SSI for lithium has been identified. It has been determined that the ASD analysis conducted in 2021 continues to provide a rationale for a source other than the CCR unit causing the exceedance of groundwater protection standards (GWPS) in downgradient wells.

Exceedances of GWPS were identified at the following monitoring wells downgradient of the former Scrubber Ponds during the fall 2022 semi-annual assessment monitoring event completed between August 16 and August 17, 2022:

- MW111 – lithium
- MW117 – lithium
- MW118 – lithium
- MW120 – lithium

Table 1 Summary of Measured Lithium Concentrations Compared to Groundwater Protection Standards

Sampling Event	Monitoring Well	Lithium (mg/L)	Lithium GWPS
Assessment Monitoring – 2022 #2 (Fall)	MW111	0.225	0.0631*
	MW117	0.122	
	MW118	0.084	
	MW120	0.176	
Assessment Monitoring – 2022 #1 (Spring)	MW111	0.166	0.0631*
	MW117	0.118	
	MW118	0.068	
	MW120	0.129	
Assessment Monitoring – 2021 #2 (Fall)	MW111	0.194	0.0631*
	MW117	0.115	
	MW118	0.082	
	MW120	0.135	
Assessment Monitoring – 2021 #1 (Spring)	MW111	0.158	0.0631*
	MW117	0.110	
	MW118	0.068	
	MW120	0.120	
Assessment Monitoring – 2020 #2 (Fall)	MW111	0.227	0.0678
	MW117	0.135	
	MW118	0.095	
	MW120	0.135	
Assessment Monitoring – 2020 #1 (Spring)	MW111	0.190	0.0678
	MW117	0.130	
	MW118	0.085	
	MW120	0.145	

* GWPS for lithium updated in Spring 2021 with collection of new upgradient monitoring data. Additional assessment monitoring lithium concentrations are included in the 2018 and 2019 Annual Groundwater Monitoring and Corrective Action Reports (Barr, 2019a, 2020b).

1.2 Scope of Work

As part of the ASD, site data were evaluated to determine whether the regulated CCR unit caused the SSIs over background levels for lithium in downgradient monitoring wells. As part of this evaluation, two hypotheses were developed and then tested with lines of evidence based on site data to determine if those hypotheses were valid. The evidence confirms that the SSIs were caused by a natural variation in groundwater quality rather than the former Scrubber Ponds. As a result, it was determined an alternative source exists for the SSIs and resulting exceedances of the GWPS for lithium under the CCR Rule (§ 257.95(g)(3)(ii)).

1.3 Regulatory Framework

As noted above, the former Scrubber Ponds are currently in assessment monitoring in anticipation of closure through removal of CCR. Baseline groundwater monitoring was completed in 2017, as documented in the 2017 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area (Barr, 2018). A detection monitoring program began on October 17, 2017, and continued until April 14, 2018 (Barr, 2019a). SSIs over background levels were determined for certain constituents listed in appendix III to the CCR Rule (§ 257.95(a)) in 2018 (total dissolved solids (TDS), fluoride, boron, calcium, chloride, pH, and sulfate). In response to these SSIs, an assessment monitoring program was initiated on April 15, 2018. This program continued through 2022.

On January 2, 2019, it was determined that the initial assessment monitoring and resample events resulted in detections of lithium at statistically significant levels above applicable GWPS. An assessment of corrective measures (ACM) was initiated on April 2, 2019, and completed on August 29, 2019 (Barr, 2019b). An ASD ended the selection of remedy phase of remedial actions required by the CCR Rule on January 31, 2021 (Barr, 2021). The Site is currently in assessment monitoring.

1.4 Description of the Monitoring Well System

The groundwater monitoring system is a multi-unit groundwater monitoring system, as provided in § 257.91(d), meaning that both the former Scrubber Ponds and the former TSP are monitored by a single groundwater monitoring system. The monitoring well system around the CCR unit consists of three hydraulically upgradient wells (MW-103, MW-110, and MW-119) and four downgradient wells (MW-111, MW-117, MW-118, and MW-120) as shown on Figure 1.

The geological strata at the Site consists of fine- and coarse-grained unconsolidated alluvial sediments overlying bedrock (Ft. Union Formation). The upgradient wells are screened in primarily coarse-grained sediments. The downgradient monitoring wells are located hydraulically downgradient of the CCR unit along the waste boundary, are spaced approximately 500 feet (or less) apart, and are screened in primarily fine-grained sediments. The number, spacing, and hydraulic positions of the monitoring wells comply with requirements outlined in § 257.91(a-c) of the CCR Rule.

1.5 Groundwater Standards

Once assessment monitoring is triggered for a CCR unit, § 257.95(d)(2) requires that GWPS be established for appendix IV constituents detected in groundwater. GWPS are defined as the higher of the Maximum Contaminant Level (MCL) or default GWPS, and the background concentration level for the detected constituent based on statistical methods established in § 257.93(f-g). Based on § 257.95(h)(2) and the July 30, 2018, Phase 1 CCR Rule revision, a final GWPS was established for the appendix IV constituents detected in groundwater.

The Phase 1 revision to the CCR Rule included a default lithium groundwater protection standard of 40 µg/L (0.04 mg/L) on July 30, 2018. The laboratory analyzing Site groundwater samples lowered its lithium reporting limit from 0.1 mg/L to 0.04 mg/L starting in July 2018, and then subsequently to 0.02 mg/L. Previous lithium data from the Site, which were mostly below detection at higher limits, were

removed from the baseline groundwater dataset, and additional data were collected. As a result of these changes, the lithium GWPS has been updated twice as additional upgradient samples have been collected and analyzed.

2 ASD Hypotheses

The hypotheses and corresponding determinations supporting the ASD are summarized below.

2.1 Hypothesis No. 1: Natural Variation

More naturally occurring lithium is present in the fine-grained sediments than in coarse-grained sediments. As a result, groundwater in zones of fine-grained sediments will typically have higher lithium concentrations than groundwater in zones of coarse-grained sediments. The upgradient wells at the Site are screened in primarily coarse-grained sediments and downgradient wells at the Site are screened in primarily fine-grained sediments. Therefore, due to the natural variability between sediments in which upgradient and downgradient wells are screened at the Site, it is possible that the observed downgradient lithium concentrations are due to natural variation in lithium content in the sediments.

2.1.1 Variation in Solids Concentration with Sediment Type within the Aquifer Matrix

To test hypothesis No. 1, a total of eight Site sediment samples (see Table 2) from five different borings were sent to Pace Inter-Mountain Laboratories (Pace) in Sheridan, Wyoming. The sediment samples were crushed in a mill and analyzed for total lithium (Total Metals) using EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition*, methods 3050 and 6010. Logs for the five borings are presented in Appendix A.

Both samples from boring SB-3 were judged to be relatively well graded. As such, the samples were sieved using a no. 230 sieve. The fraction retained on the sieve is sand and gravel (coarse-grained sediments) and the fraction passing the sieve is silt and clay (fine-grained sediments). Both fractions were crushed and analyzed for lithium. The remaining samples were determined to be more homogenous and, therefore, did not require sieving.

Analytical results for the sediment samples are summarized in Table 2. The lithium concentrations for fine-grained sediments (clay and silt) ranged from 11.5 milligrams per kilogram (mg/kg) to 22.7 mg/kg, with an average concentration of 16.1 mg/kg. In the coarse-grained sediments (sand and gravel), the concentrations ranged from 4.0 mg/kg to 6.9 mg/kg, with an average concentration of 5.4 mg/kg. The results indicate that the average lithium concentration in the fine-grained sediments is more than three times the average lithium solids concentration in the coarse-grained sediments. The laboratory report for the analysis of the sediment samples is included in Appendix B.

Table 2 Lithium Solids Concentration by Sample Material Type

Texture	Sample ID	Sample Depth within Boring (ft)	Lithium Result (mg/kg)
Fine	SB-2	2 to 5	11.5
Fine	SB-3	3.5 to 10.5	13.6
Fine	SB-3	10.5 to 15	14.2
Fine	T-2	23.5 to 30	18.1
Fine	T-13	3.5 to 10	16.2
Fine	T-13	15 to 20	22.7
Fine Average			16.1
Fine Range			11.5 to 22.7
Coarse	SB-2	10 to 20	4.9
Coarse	SB-3	3.5 to 10.5	5.8
Coarse	SB-3	10.5 to 15	6.9
Coarse	T-1	19 to 23	4.0
Coarse Average			5.4
Coarse Range			4.0 to 6.9

2.1.2 Variation in Lithium Mobility with Sediment Type

The sediment analysis presented above confirmed that fine-grained sediments at the Site have more lithium within the solid matrix than coarse-grained sediments. Leach tests, which simulate what the lithium concentrations would be in groundwater, were done on sediment samples from areas at the Site that have not been affected by the CCR unit to estimate how much naturally occurring lithium could be mobilized from the solid matrix to groundwater.

Ten additional borings (T-14 through T-23) and associated temporary wells were installed across the Site, scattered upgradient and side gradient of the CCR unit to obtain samples for this evaluation. Borings T-14 through T-22 were located in areas that are not hydraulically downgradient from any of the current or former CCR units (Figure 2). It was subsequently determined that boring location T-23 may have been affected by historical (pre-CCR Rule) Site activities not associated with any CCR units so the analytical results for the sample from boring T-23 were not carried forward in the evaluation. Logs for these borings are presented in Appendix A.

Pace analyzed sediment samples from these borings by a saturated paste extract procedure (SPE Method; Pace SOP S-SATPASTE-1.1). Samples that had dried and hardened were crushed using a mortar and pestle; however, rock fragments larger than #10 mesh (2 mm) were removed from the samples for the SPE Method analyses.

Analytical results for samples classified as fine-grained or coarse-grained from borings T-14 through T-22 are summarized in Table 3. The laboratory report for the analyses is presented in Appendix B. The lithium concentrations leached from the fine-grained material in the liquid extract ranged from 0.02 to 0.14 mg/L,

with an average of 0.06 mg/L. The lithium concentrations leached from the coarse-grained material in the liquid extract ranged from 0.02 to 0.06 mg/L, with an average of 0.03 mg/L. These results indicate that in areas that could not have been influenced by the CCR units (existing and closed) the fine-grained sediments release more lithium to groundwater, and with greater variation, than coarse-grained sediments. The results also indicate that the average SPE leachate lithium concentration from fine-grained sediments was approximately twice the average leachate lithium concentration from the coarse-grained sediments.

Table 3 Summary Saturated Paste Extracts for Lithium

Sediment Type	Boring ID	Sample Depth within Boring (ft)	Sediment Type (field-estimated composition in boring logs)	Lithium Result (mg/L)
Fine	T-14	5-7	>95% fines	0.03
Fine	T-14	7-10	>90% fines	0.04
Fine	T-14	10-13	>90% fines	0.03
Fine	T-15	14.25-17.5	100% fines	0.04
Fine	T-16	11-13	100% fines	0.02
Fine	T-17	10.75-15	100% fines	0.07
Fine	T-18	12.5-14.5	100% fines	0.14
Fine	T-20	5.5-8.25	100% fines	0.02
Fine	T-21	13.75-15	100% fines	0.08
Fine	T-22	3.5-10	100% fines	0.03
Fine	T-22	10-15	100% fines	0.10
Fine	T-22	15-20	100% fines	0.10
Fine Average				0.06
Fine Range				0.02 to 0.14

Sediment Type	Boring ID	Sample Depth within Boring (ft)	Sediment Type (field-estimated composition in boring logs)	Lithium Result (mg/L)
Coarse	T-15	5-10	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.03
Coarse	T-15	10-14.25	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.02
Coarse	T-16	3-11	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.03
Coarse	T-17	5-10.75	Well graded sand with silt (5% gravel, 85% sand, 10% fines)	0.02
Coarse	T-18	5-10	Well graded sand with silt and gravel (15% gravel, 75% sand, 10% fines)	0.03
Coarse	T-18	10-12.5	Well graded sand with silt and gravel	0.02
Coarse	T-19	3.5-5	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.06
Coarse	T-19	5-10	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.02
Coarse	T-19	10-14.5	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.02
Coarse	T-21	5-13.75	Poorly graded sand with silt and gravel (15% gravel, 70% sand, 15% fines)	0.05
Coarse Average				0.03
Coarse Range				0.02 to 0.06

Temporary wells were installed in borings T-14 through T-22 to facilitate collection of groundwater samples. The groundwater samples were analyzed for lithium at Minnesota Valley Testing Laboratories. As can be seen on Figure 2, the lithium concentrations detected in the samples from temporary wells T-20 and T-22, which were completed in fine-grained sediments, were 1.6 to 2.3 times the lithium concentrations in the samples collected from temporary wells completed in coarse-grained sediments. These analytical results for the groundwater samples corroborate the results of the leach testing. Field sampling forms and the laboratory report for the analyses of the groundwater samples are presented in Appendix B.

2.1.3 Statistical Upper Limit of Natural Variability

As shown above, fine-grained sediments at the Site have generally higher lithium content than coarse-grained sediments at the Site. As a result, higher lithium concentrations can be leached from fine-grained sediments than from coarse-grained sediments at that Site. The lithium GWPS (0.0631 mg/L) was established by calculating the parametric upper tolerance limit for background lithium concentrations measured in groundwater samples from the upgradient wells in the CCR monitoring network, consistent with the CCR Rule. Well logs (Appendix A) show that upgradient wells are screened in primarily coarse-grained soils while downgradient wells are screened in primarily fine-grained soils. Therefore, the effect of

the geologic variability at the Site on naturally occurring lithium concentrations in groundwater is not captured in the existing GWPS determination.

To understand an upper limit of lithium concentration in groundwater that might result from natural variability, the fine-grained sediment leaching data presented in Table 3 was used to calculate an upper prediction limit of 0.16 mg/L (Figure 3), which is more than 2.5 times the established GWPS. This upper limit of natural variability more accurately represents potential downgradient background concentrations.

2.1.4 Conclusions

The analytical data confirm that more naturally occurring lithium is present in fine-grained sediments than in coarse-grained sediments at the Site and that more lithium is mobilized to the liquid phase from the fine-grained sediments than from the coarse-grained sediments. As a result of the natural variation in lithium content, groundwater in zones of fine-grained sediments will contain more lithium than groundwater in zones of coarse-grained sediments. The average lithium concentration in SPE leachate, intended to simulate groundwater conditions, from fine-grained sediments is approximately twice the concentration in leachate from coarse-grained sediments.

The upgradient wells in the CCR monitoring network are screened in predominantly coarse-grained sediments whereas the downgradient wells are screened in predominantly fine-grained sediments (Figure 2).

Finally, statistical evaluation of lithium concentrations obtained from the analyses of SPE leachate from fine-grained sediments resulted in a statistical upper limit of natural variability that is more than 2.5 times the GWPS. Based on these geologic relationships, elevated concentrations of lithium in downgradient wells are to be expected due to the upper limit of natural variability for the Site, and exceedances of the GWPS in these wells are the result in part due to natural variation in groundwater quality. Lithium concentrations in MW117 and MW118 are lower than the statistical upper limit of natural variability.

2.2 Hypothesis No. 2: Carbonaceous Zone

Naturally occurring carbonaceous zones within the aquifer matrix, which typically exhibit elevated lithium concentrations, are present in fine-grained sediments within or near the screened intervals of downgradient wells in the CCR monitoring network. As a result, it is possible that the GWPS based on upgradient wells is not representative of the background lithium concentrations in downgradient wells.

2.2.1 Lithium Concentrations within Carbonaceous Material

Carbonaceous materials are defined herein to include lignite or other types of coal, or other organic materials, that are inferred to contain visually significant amounts of carbon. To determine if the carbonaceous material could be contributing to the elevated downgradient groundwater concentrations, eight samples of carbonaceous material were extracted from available sediment cores (obtained from previous Site investigations) and subjected to the SPE leachate extraction analysis. Logs for the borings associated with these sediment cores are presented in Appendix A.

As shown in Table 4, SPE leachate analyses of carbonaceous samples for lithium identified concentrations ranging from 0.06 to 0.13 mg/L, with an average concentration of 0.09 mg/L. The average lithium concentration in the carbonaceous material SPE leachate, intended to simulate groundwater conditions, is 1.5 times the average concentration from fine-grained samples and three times the average concentration from coarse-grained samples, raising the potential upper range for lithium concentration due to natural variability when compared to fine-grained sediments without carbonaceous material. The laboratory report for the analyses of carbonaceous material samples is presented in Appendix B.

Table 4 Summary of SPEs for Lithium in Carbonaceous Materials

Boring ID	Sample Depth within Boring (ft)	Lithium Result (mg/L)
SB-2	20.5-21	0.11
T-2	22.5-23.5	0.07
T-3	30-32.5	0.13
T-5	10-15	0.09
T-6	19.5-20	0.08
T-17	10.75-15	0.10
T-18	12.5-14.5	0.09
T-22	10-15	0.06
average		0.09
range		0.06 to 0.13

2.2.2 Carbonaceous Material Location Compared to Downgradient Wells

Carbonaceous material was identified in the MW-111 boring log (Appendix A) at a depth of approximately 3 feet below the well screen. Common industry practice is to backfill any over-drilled depth below the well screen using filter pack sand. This backfill below the well screen would allow transfer of groundwater from the carbonaceous zone to the well screen during sampling, likely affecting water quality.

The boring logs for the remaining downgradient wells did not identify carbonaceous material, though the older Site wells provide little detail on the materials encountered during well construction. Since carbonaceous zones can be thin, these zones could be present in the downgradient wells even though they were not noted on the well logs. While downgradient CCR monitoring network wells MW-117, MW-118, and MW-120 do not document carbonaceous material at the well locations, additional borings surrounding these downgradient wells provided evidence of carbonaceous zones (Figure 2). Table 5 provides the maximum and most recent lithium concentrations measured in downgradient wells and the approximate distances from the downgradient wells to the nearest boring in which carbonaceous material was identified. Measured lithium concentrations tended to be higher in groundwater where a downgradient carbonaceous zone was identified closer to the well, with the highest lithium concentration correlating to well MW-111 where carbonaceous material was documented within the boring (Appendix B).

Table 5 Carbonaceous Zone Correlation to Downgradient Groundwater Concentrations

Downgradient CCR Well	Maximum Measured Lithium Concentration in Groundwater* (mg/L)	Fall 2022 Lithium Concentration in Groundwater (mg/L)	Distance to Closest Boring with Documented Carbonaceous Material (ft)
MW-111	0.227	0.225	within boring
MW-120	0.176	0.176	125
MW-117	0.155	0.122	160
MW-118	0.102	0.084	280

*Maximum lithium concentration measured in assessment monitoring groundwater samples.

By inference from the information presented above, elevated concentrations of lithium in MW-111 are attributable to the presence of carbonaceous materials within the well boring. The site investigation boring logs document that carbonaceous material is present at the distances shown in Table 5 from each downgradient well. Based on the information in Table 5, there appears to be a relationship between groundwater lithium concentrations and distance to the nearest documented location of carbonaceous material, although carbonaceous material may be closer to the wells than documented by the borings.

Since the average lithium concentration SPE leachate analyses is about 1.5 times the average for fine-grained materials, it would be anticipated that lithium in groundwater samples that are influenced by carbonaceous materials would be much higher. It is apparent that carbonaceous materials in the downgradient monitoring zone have a significant impact on lithium concentrations in these wells and the regulated CCR unit is not the cause of elevated concentrations.

2.2.3 Conclusion

The average lithium concentration in the carbonaceous material SPE leachate is greater than the average concentrations in leachate from fine-grained or coarse-grained sediment samples. The locations where carbonaceous material was identified in boring logs also appear to correlate with the elevated lithium concentrations in CCR monitoring network wells. For instance, monitoring well MW-111 has the highest lithium concentration for the fall 2022 event (0.225 mg/L) and is the only downgradient well with carbonaceous material documented in the well's boring log. The detected lithium concentration appears to be within the range of natural variability when carbonaceous material is present. These data show that the presence of carbonaceous material in the aquifer matrix contributes to elevated lithium in downgradient groundwater.

3 Conclusion

The analysis summarized in this report supports a demonstration, consistent with requirements of § 257.95(g)(3)(ii) of the CCR Rule, that the presence of concentrations of lithium at statistically significant levels above the GWPS are attributable to sources other than the CCR unit. The following hypotheses were proven to support this determination:

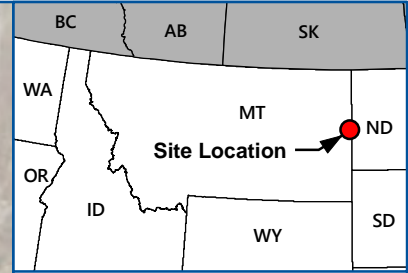
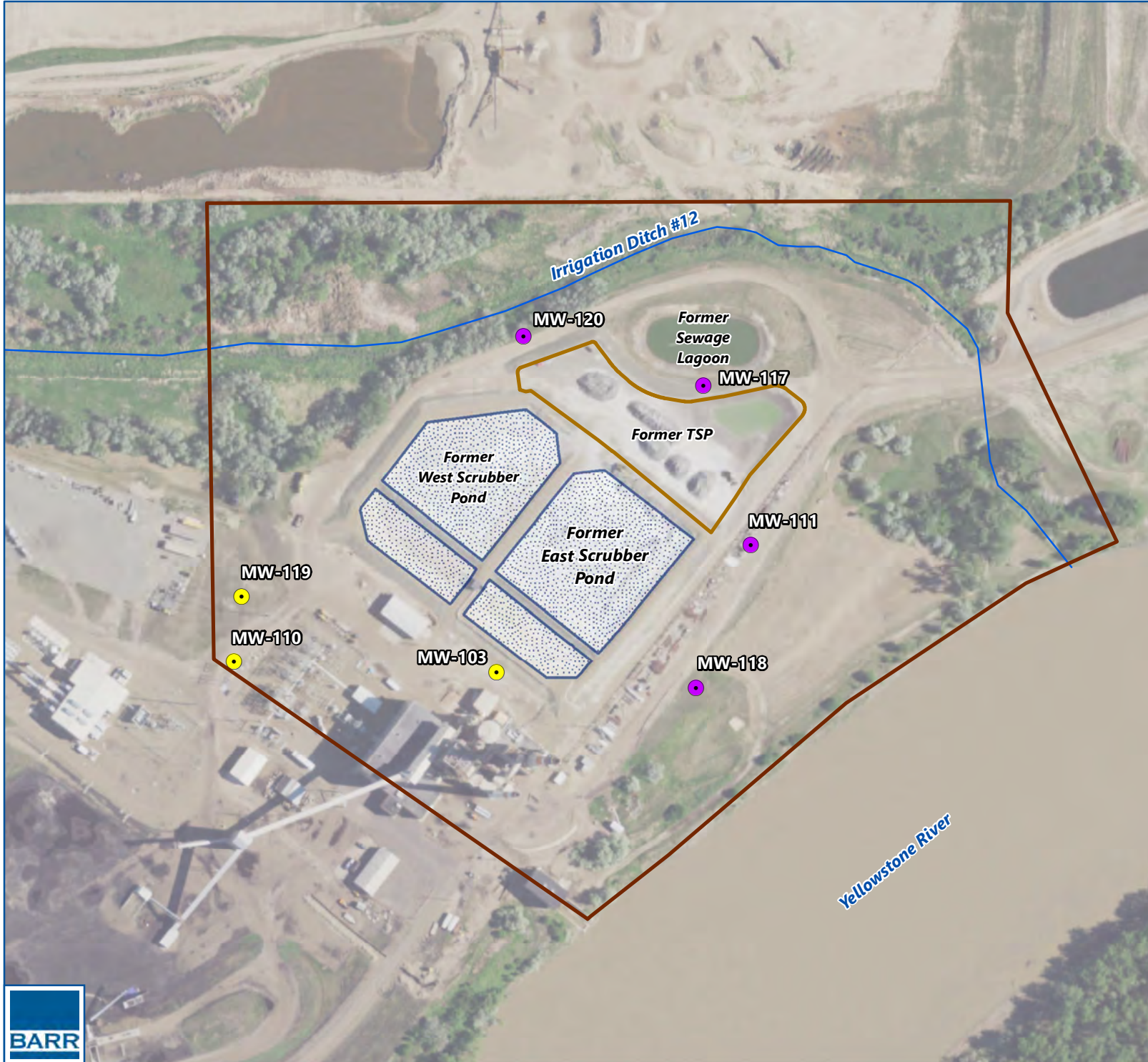
- **Hypothesis No. 1:** Due to the natural variability between sediments in which upgradient and downgradient wells are screened, the observed downgradient concentrations are due in part to the natural variation in lithium content of the sediments.
- **Hypothesis No. 2:** The GWPS based on upgradient wells is not representative of the background lithium concentrations in downgradient wells due to naturally occurring carbonaceous zones within the aquifer matrix present in fine-grained sediments within or near the screened intervals of the downgradient wells.






Taken together, the lines of evidence presented above provide adequate documentation and support that an alternative source is responsible for the presence of lithium at statistically significant concentrations above the GWPS. Therefore, it is concluded that the combined effects of natural variability and presence of carbonaceous material in the area downgradient from the CCR unit establish an alternative source, and there does not appear to be a release from the former Scrubber Ponds.

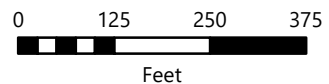
4 References

- Barr Engineering Co., 2016. Evaluation of Existing Surface Impoundment Liner, West and East Scrubber Ponds. Prepared for Montana-Dakota Utilities, September 2016.
- Barr Engineering Co., 2018. 2017 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities, January 2018.
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- Barr Engineering Co., 2020a. Alternative Source Demonstration, Temporary Storage Pad, Lewis & Clark Station. Prepared for Montana Dakota Utilities, November 2020.
- Barr Engineering Co., 2020b. 2019 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area, Lewis & Clark Station. Prepared for Montana Dakota Utilities, January 2020.
- Barr Engineering Co., 2021. 2020 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area, Lewis & Clark Station. Prepared for Montana Dakota Utilities, January 2021.

Figures



-  Upgradient Monitoring Well
-  Downgradient Monitoring Well
-  Former Scrubber Ponds
-  Former Temporary Storage Pad (TSP)
-  Site Boundary

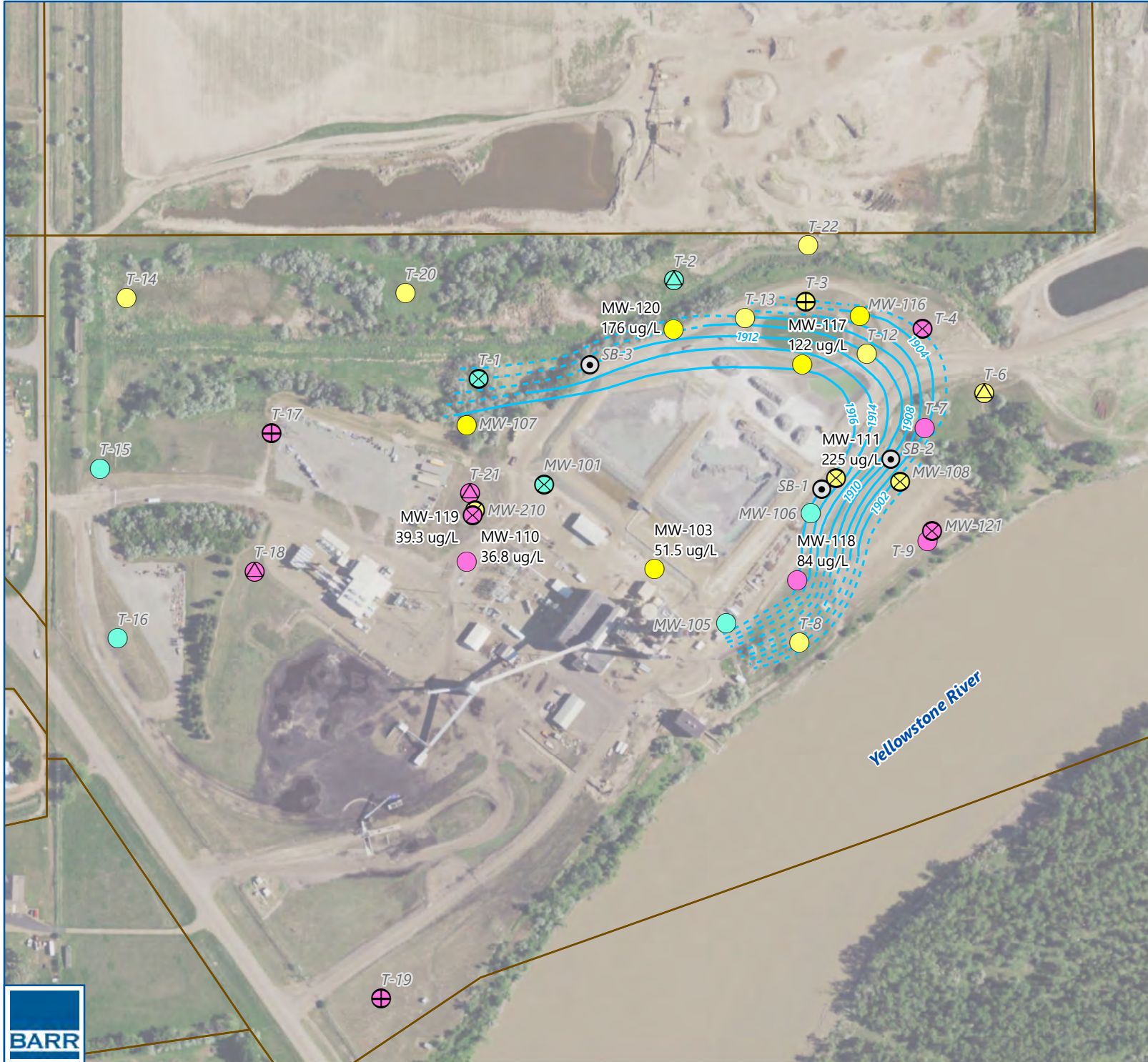


Imagery: 2021 NAIP, USDA-FSA

SITE LAYOUT
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT

FIGURE 1





- Soil Boring Location
 - Groundwater Contour (dashed where inferred)
 - Parcel Boundary
- Material Type within Well Screen**
- Coarse Material
 - Fine Material
 - Mixed Material
- Carbonaceous Material Presence**
- Above Well Screen
 - In Well Screen
 - Below Well Screen

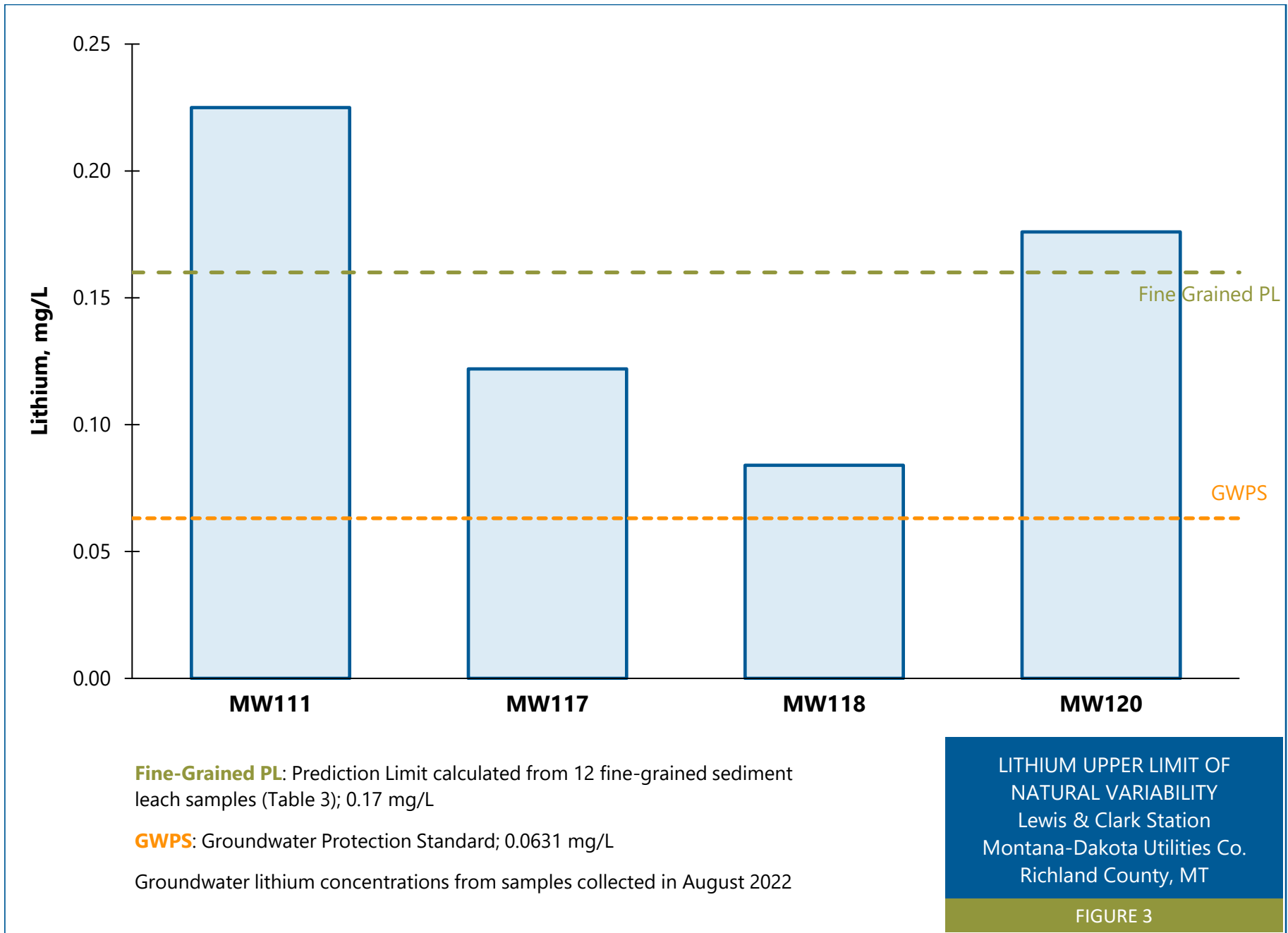
Note:
Material type and carbonaceous material presence were determined from boring logs (Appendix A). Lithium concentrations previously measured in samples collected from temporary wells (T-1 through T-13 in January 2019 and T-14 through T-23 in April 2020) are documented in Appendix B.

0 175 350 525
Feet

Imagery: 2021 NAIP, USDA-FSA

**WELL MATERIAL TYPES AND
LITHIUM CONCENTRATIONS
FALL 2022**
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT
FIGURE 2





Appendices

Appendix A
Site Boring Logs

LOG OF BORING



PROJECT: W86-007 SOIL BORINGS Fly Ash Sludge Lagoons MDU Lewis & Clark Station Sidney, MT	BORING: ST-103W LOCATION: Middle of SW side of lagoons, see N.C.C. drawing
DATE: 1/21/86	SCALE: 1"=4'

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
23.2						
22.7	.5		GRAVEL surfacing			gp
19.7	3½	CL	SILTY CLAY, low to medium plasticity, dark brown to grayish brown, moist, very stiff (fine alluvium)	21		4+
16.7	6½	CL	SANDY CLAY, low plasticity, brown, moist, rather stiff (fine alluvium)	10		2
		GW-GM	SANDY GRAVEL, fine to medium grained, a little silt, wet to waterbearing, loose to dense (coarse alluvium)	17		
				5		
				57		
08.2	15					
06.2	17	ML	SANDY SILT, nonplastic, light gray, moist, very dense (siltstone)	52		1 3/4
		CH	FAT CLAY, high plasticity, light gray, moist, hard (claystone)			
02.7	20½			38		4+
			Water level down 10.1' with 19' of hollow-stem auger in the ground			
			Water level down 9.3' immediately after withdrawal of auger			
			2" PVC monitoring well installed to a depth of 19', see sketch			

WELL LOG REPORT

State law requires that the Bureau's copy be filed by the water well driller within 60 days after completion of the well.

1. WELL OWNER Name MDU Lewis & Clark Sta

2. CURRENT MAILING ADDRESS
400 North 4th
Bismarck, ND 58501

3. WELL LOCATION
SE 1/4 NW 1/4 SW 1/4 Section 9
Township 22 N Range 59 E County Richland
Gov't Lot _____, or Lot _____, Block _____
Subdivision Name _____
Tract Number _____

4. PROPOSED USE: Domestic Stock Irrigation
Other specify Monitoring

5. TYPE OF WORK: Hollowstem Auger x
New well Method: Dug Bored
Deepened Cable Driven
Reconditioned Rotary Jetted

6. DIMENSIONS: Diameter of Hole
Dia. 8 in. from 0 ft. to 18 ft.
Dia. _____ in. from _____ ft. to _____ ft.
Dia. _____ in. from _____ ft. to _____ ft.

7. CONSTRUCTION DETAILS:
Casing; Steel Dia. _____ from _____ ft. to _____ ft.
Threaded Welded Dia. _____ from _____ ft. to _____ ft.
Type _____ Wall Thickness _____
Casing; Plastic Dia. 2 from +1.8 ft. to 8 ft.
Weight SDR-21 Dia. _____ from _____ ft. to _____ ft.
PERFORATIONS: Yes No
Type of perforator used _____
Size of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

SCREENS: Yes No
Manufacturer's Name Timco PVC
Type _____ Model No. _____
Dia. 2 Slot size #10 from 8 ft. to 15 ft.
Dia. _____ Slot size _____ from _____ ft. to _____ ft.

GRAVEL PACKED: Yes No Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

ROUTED: To what depth? 7 ft.
Material used in grouting 263# bentonite chips

8. WELL HEAD COMPLETION:
Pitless Adapter Yes No

9. PUMP (if installed)
Manufacturer's name _____
Type _____ Model No. _____ HP. _____

10. WELL TEST DATA
The information requested in this section is required for all wells. All depth measurements shall be from the top of the well casing.
All wells under 100 gpm must be tested for a minimum of one hour and provide the following information:
a) Air _____ Pump _____ Bailer _____
b) Static water level immediately before testing _____ ft. If flowing; closed-in pressure _____ psi. _____ gpm.
Flow controlled by: _____ valve, _____ reducers, _____ other, (specify) _____
c) Depth at which pump is set for test _____
d) The pumping rate: _____ gpm.
e) Pumping water level _____ ft. at _____ hrs. after pumping began.

f) Duration of test: Pumping time _____ hrs.
g) Recovery time _____ hrs.
h) Recovery water level _____ ft. at _____ hrs. after pumping stopped.

Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form.
NOTE: All wells shall be equipped with an access port 1/2 inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.

11. WAS WELL PLUGGED OR ABANDONED? Yes No
If yes, how? _____

12. WELL LOG #3, 110.
Depth (ft.) From To Formation

0	0.3	Silt, sandy w/gravel, dark brown
0.3	1	Silt, sandy w/gravel, reddish brown
1	4	Silt, sandy w/gravel & cobbles, medium brown
4	14	Gravel, to coarse, w/cobbles, abt 30% sand, med. brown
14	18	Silt, light blue, Bedrock

ATTACH ADDITIONAL SHEETS IF NECESSARY

13. DATE COMPLETED 8/28/91

14. DRILLER/CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.
Date 1 Dec 91
Firm Name Water Supply Inc
Address 2501 Twin City Dr
Mandan, ND 58504
Signature [Signature] License No. 296/004

Project: Lewis and Clark Station
 Project No.: 26411007.00 PH1-014
 Location: Sidney, Montana
 Coordinates: UTM 13N N:2248510.70m, E:3584876.38m
 Datum: NAVD88

Surface Elevation: 1917.5 ft
 Drilling Method: Hollow Stem Auger
 Sampling Method: Split Spoon
 Completion Depth: 19.0 ft

Top of Casing Elev.: 1920.3 ft
 Unique Well No.:

Depth, feet	Sample Type & Recovery	Sample No.	SCSU	Graphic Log	LITHOLOGIC DESCRIPTION	MAJOR UNIT	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0			CL		TOPSOIL - SANDY CLAY (CL): fine grained; brown; frozen.	Fill	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3'	1917.5
2.5			CL/ML		FILL - SILTY CLAY (CL/ML): yellow; moist; medium to high plasticity; strong HCl reaction; 0% gravel, 5% sand, 95% fines, orange staining.			1915.0
5.0			CL/ML		SILTY CLAY TO CLAY (CL/ML): light yellow brown - to olive yellow; moist to wet; low to medium plasticity; 0% gravel, 0% sand, 100% fines, hard to very hard, black oxidation spots, trace orange oxidation, rusty oxidation on fracture boundaries, very fine grain sand.	Alluvium	RISER CASING Diameter: 2" Type: Sch 40 PVC Interval:	1912.5
7.5			CL/ML					GROUT Type: Concrete Interval: 0-1' bgs
10.0			CL		CLAY (CL): gray; dry to moist; high plasticity; strong HCl reaction; 0% gravel, 0% sand, 100% fines, very hard, Fort Union Formation, black oxidation spots, rusty oxidation on fracture boundaries, occurrence of silty clay, low to high plasticity.	Fort Union	SEAL Type: Bentonite chips Interval: 1-4.5' bgs	1907.5
12.5			CL		13': Dry, no oxidation, non-plastic.		SANDPACK Type: 20/40 Interval: 4.5-10' bgs	1905.0
15.0			CL				SCREEN Diameter: 2" Type: No. 10 Sch 40 Interval: PVC 5-10' bgs	1902.5
17.5								1900.0
19.0					End of well 19.0 feet			

Date Boring Started: 2/20/16
 Date Boring Completed: 2/21/16
 Logged By: DJZ
 Drilling Contractor: Terracon
 Drill Rig: CME-55

Remarks:

Additional data may have been collected in the field which is not included on this log.
 Weather: 25°F, overcast

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Project: Lewis and Clark Station
 Project No.: 26411007.00 PH1-014
 Location: Sidney, Montana
 Coordinates: UTM 13N N:2247960.01m, E:3584863.71m
 Datum: NAVD88

Surface Elevation: 1921.1 ft
 Drilling Method: Hollow Stem Auger
 Sampling Method: Split Spoon
 Completion Depth: 12.0 ft

Top of Casing Elev.: 1924.1 ft
 Unique Well No.:

Depth, feet	Sample Type & Recovery	Sample No.	SCSU	Graphic Log	LITHOLOGIC DESCRIPTION	MAJOR UNIT	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0			CL		TOPSOIL - SANDY CLAY (CL): dark olive gray; frozen.	Fill		
2.5			SW		SAND WITH GRAVEL (SW): very dark grayish brown; dry to wet; 25% gravel, 75% sand, 0% fines, fine-to-medium-grained subangular sand; subangular gravel with some cobbles, well graded.	Alluvium	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3' RISER CASING Diameter: 2" Type: Sch 40 PVC Interval:	1920.0
5.0							Type: Concrete Interval: 0-1' bgs SEAL Type: Bentonite chips Interval: 1-5' bgs	1917.5
7.5					8: Medium/coarse grained, subangular sand with small to large subangular cobbles and gravels.		SANDPACK Type: 20/40 Interval: 5-12' bgs	1915.0
10.0			ML		Rusty brown water at contact. SILT (ML): very pale brown; moist; low plasticity; some brown layers within.	Fort Union	SCREEN Diameter: 2" Type: No. 10 Sch 40 Interval: PVC 6-11' bgs	1912.5
12.5			CL		CLAY (CL): gray; moist; very hard, homogenous, Fort Union Formation, non-plastic. End of well 12.0 feet			
15.0								
17.5								
20.0								

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Date Boring Started: 2/21/16
 Date Boring Completed: 2/22/16
 Logged By: DJZ
 Drilling Contractor: Terracon
 Drill Rig: CME-55

Remarks:

Additional data may have been collected in the field which is not included on this log.
 Weather: 20°F, fog

Project: Lewis and Clark Station
 Project No.: 26411007.00 PH1-014
 Location: Sidney, Montana
 Coordinates: UTM 13N N:2248125.79m, E:3584035.03m
 Datum: NAVD88

Surface Elevation: 1923.3 ft
 Drilling Method: Hollow Stem Auger
 Sampling Method: Split Spoon
 Completion Depth: 16.0 ft

Top of Casing Elev.: 1926.3 ft
 Unique Well No.:

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Depth, feet	Sample Type & Recovery	Sample No.	SCSC	Graphic Log	LITHOLOGIC DESCRIPTION	MAJOR UNIT	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0					TOPSOIL - SANDY CLAY MIX: black; dry; less than 1".			
2.5			GW		FILL - GRAVEL WITH SAND (GW): pinkish gray; dry to wet; 50% gravel, 50% sand, 0% fines, well graded, large to small subrounded gravel and cobbles, fine to coarse grained subangular sand, no HCL reaction.	Fill	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3' RISER CASING Diameter: 2" Type: Sch 40 PCV Interval:	1922.5 1920.0
5.0			SW		SAND WITH GRAVEL (SW): pinkish gray; moist to wet; 40% gravel, 55% sand, 5% fines, well graded fine to coarse grained sand, large to small subrounded gravel and cobbles.	Alluvium	GROUT Type: Neat Cement Interval: 3-5' bgs SEAL Type: Bentonite chips Interval: 5-7' bgs SANDPACK Type: 20/40 Interval: 7-16' bgs SCREEN Diameter: 2" Type: No. 10 Sch 40 Interval: PVC 9-14' bgs	1917.5 1915.0 1912.5
7.5					7': Some orange/black oxidation in sand.			
10.0					10': Some heaving sand.			
15.0			ML		SILT (ML): gray; moist; 0% gravel, 0% sand, 100% fines, very hard, non-plastic, low HCL reaction.	Fort Union		
15.75					15.75: Lignite lense.			
16.0					End of well 16.0 feet			1907.5

Date Boring Started: 2/18/16
 Date Boring Completed: 2/18/16
 Logged By: DJZ
 Drilling Contractor: Terracon
 Drill Rig: CME-55

Remarks:

Additional data may have been collected in the field which is not included on this log.
 Weather: 35°F, overcast

Project:	Lewis and Clark Station	Surface Elevation:	1919.0 ft	Top of Casing Elev.:	1922.0 ft
Project No.:	26411007.00 PH1-014	Drilling Method:	Hollow Stem Auger		
Location:	Sidney, Montana	Sampling Method:	Split Spoon		
Coordinates:	UTM 13N N:m, E:m	Completion Depth:	16.0 ft		
Datum:	NAVD88				

Depth, feet	Sample Type & Recovery	Sample No.	Blows/6in.	ENVIRONMENTAL DATA	U C S S	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0							CLAY FILL (CL-CH): yellowish brown (10YR 5/4); frozen; hard; roots.		
2.5			7-9-14-18.	G/S/F:0%/ 0%/ 100% G/S/F:15%/ 60%/ 25%			SAND W/ GRAVEL (SP-SC): brown (10YR 4/3); moist; very fine grained sand, subround gravels, large to small.	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3'	1917.5
5.0			8-12-13-10.	G/S/F:5%/ 70%/ 25% G/S/F:0%/ 5%/ 95%			CLAY (CL-CH): light yellowish brown (2.5Y /4); moist to wet; hard; crumbly, areas of CLAYSTONE within.	RISER CASING Diameter: 2" Type: Sch 40 PCV Interval:	1915.0
7.5			5-6-7-11.	G/S/F:15%/ 15%/ 80%			At 5': 4" FAT CLAY (CH), brown (10YR 4/3), hard Increasing sand and gravels within claystone. Mostly fine grained sand, smal gravels, subround. At 6-7.5': Mix of fat clay and claystone w/ sand/gravel within w/ little silt pockets.	GROUT Type: Cement Interval: 0-1.5' bgs	1912.5
10.0			2-4-3-0.	G/S/F:5%/ 20%/ 75%			At 7.5': Transitions to SANDY CLAY (CL/CH), high plasticity with very fine to coarse grained sand within, subround to subangular. Trace gravels, small to large. Rusty red oxidation spots and fractures. Few black manganese oxidation spots. Few white precipitate veins/spots.	SEAL Type: Bentonite chips Interval: 1.5-9' bgs	1910.0
12.5			1-2-3-0.	G/S/F:10%/ 20%/ 70%	CL-CH		At 11': Color change to dark grayish brown (10YR 4/2), softer. At 12': Sample, wet.	SANDPACK Type: 10/20 Interval: 9-16' bgs	1907.5
15.0			1-3-3-0.	G/S/F:10%/ 20%/ 70%				SCREEN Diameter: 2" Type: No. 12 Sch 40 PVC Interval: 11-16' bgs	1905.0
17.5			1-2-3-4.	G/S/F:0%/ 0%/ 100%	CL-ML		SILTY CLAY/CLAYEY SILT (CL-ML): light gray/gray; wet; soft; with trace black roots and rusty orange oxidations stains.		
20.0							End of well 16.0 feet		

Date Boring Started: 1/29/18
 Date Boring Completed: 1/29/18
 Logged By: DJZ
 Drilling Contractor: SK Geotechnical
 Drill Rig:

Remarks: After 15 min., water level was at 12.9 ft bgs. After 40 min., water level was at 12.6 ft bgs.

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
 Additional data may have been collected in the field which is not included on this log.

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Project: Lewis and Clark Station	Surface Elevation: 1902.4 ft	Top of Casing Elev.: 1904.6 ft
Project No.: 26411007.14 Boundary Well	Drilling Method: Hollow Stem Auger	
Location: Sidney, Montana	Sampling Method:	
Coordinates: UTM 13N N:17326179m, E:1848702m	Completion Depth: 14.0 ft	
Datum:		

Depth, feet	Sample Type & Recovery	Sample No.	Blows/6in.	ENVIRONMENTAL DATA	S C S U	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0		1	W-2-3-3.	G/S/F:0%/ 5%/ 95%	CL		CLAY (CL): dark grayish brown (10YR 4/2); moist to wet; roots; thin fine grained sand laminations.	-6" steel protop: +3 to 2 ft bgs	
2.5		2	1-1-4-6.	G/S/F:0%/ 60%/ 40%	SM		SILTY SAND (SM): olive brown (2.5Y 4/3); moist to wet; roots; fine grained sand within; few sandy lenses.	-concrete: 0 to 2 ft bgs	1900.0
5.0		3	2-2-3-3.	G/S/F:0%/ 90%/ 10%	SP		SAND (SP): fine grained sand; trace fines, loose; light olive brown (2.5Y 5/3); moist.	-bentonite seal: 2 to 6 ft bgs	1897.5
7.5		4	1-3-3-.	G/S/F:0%/ 90%/ 10%			At 5.75 ft, 2 in lens silty clay, mottled w/ rusty orange oxidation spots. At 5.95 ft and 6.25 ft, 2 in silt lens w/ fine grained sand and mottled w/ rusty orange oxidation spots.	-2" PVC schedule 40 riser: +2.5 to 8 ft bgs	1895.0
		5	1-5-4-.	G/S/F:0%/ 95%/ 5%			At 8 ft, trace fine grained orange terracotta fragments.		
		6	W-3-5-3.	G/S/F:0%/ 90%/ 10%			At 9 ft, saturated.		
10.0		7	2-2-3-.	G/S/F:0%/ 90%/ 10% G/S/F:90%/ 10%/ 0%	GP		GRAVEL (GP): fine to coarse grained; subrounded; trace fine to coarse grained sand.	-10/20 silica sand filter pack: 6 to 13 ft bgs	1892.5
12.5		8	1-1-1-.	G/S/F:0%/ 0%/ 100%	CL-CH		CLAY [FORT UNION FORMATION] (CL-CH): very dark gray; wet; soft; high plasticity.	-2" #10 schedule 40 PVC screen: 8 to 13 ft bgs	1890.0
15.0							End of boring 14.0 feet		

Date Boring Started: 9/26/19 2:45 pm
 Date Boring Completed: 9/26/19 4:00 pm
 Logged By: DJZ
 Drilling Contractor: S&K Geotechnical
 Drill Rig:

Remarks: Dashed line indicates an inferred contact depth.
 Water level measured at time of drilling.

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
 Additional data may have been collected in the field which is not included on this log.

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Barr Engineering Company
 234 West Century Avenue
 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING SB-2

DRAFT
 SHEET 1 OF 1

Project: GeoProbe Investigation
 Project No.: 26411007.10
 Location: Lewis & Clark Station, Sidney, MT
 Coordinates: N 2,248,187.2 ft E 3,585,135.6 ft
 Datum: NAVD88

Surface Elevation: 1914.4 ft
 Drilling Method: GeoProbe Direct-Push
 Sampling Method: GeoProbe
 Completion Depth: 25.0 ft

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			CL		CLAY (CL): dark brown; frozen; with roots; 0% gravel, 0% sand, 100% fines.	
5			CL		SILTY CLAY (CL): dark yellowish brown; moist; with roots, trace fine grained sand lenses within; weak HCl reaction; 0% gravel, 1% sand, 99% fines.	1910
10			SP		SAND (SP): fine grained; light gray/tan; moist to wet; subrounded; few areas with silty sand mix within; 0% gravel, 90% sand, 10% fines.	1905
15			SP			1900
20			CL-CH		CLAY (CL-CH): Fort Union Formation; gray; moist; lean to fat; high plasticity; 0% gravel, 5% sand, 95% fines, red oxidation staining on veins/fractures.	1895
					LIGNITE COAL: black; dry.	
			CL-CH		CLAY (CL-CH): gray & tan; moist; hard; lean to fat; 0% gravel, 5% sand, 95% fines, red oxidation staining on veins/fractures, with few mottles, with black organics within.	
25					End of boring 25.0 feet	1890

Date Boring Started: 1/31/19 9:55 am
 Date Boring Completed: 1/31/19 10:15 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: Log is duplicate of MW-108
 Cave: 24.45' bgs before abandoning borehole
 Weather: 15°F, overcast, windy
 Additional data may have been collected in the field which is not included on this log.



Barr Engineering Company
 234 West Century Avenue
 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING SB-3

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1925.2 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,493.0 ft E 3,584,337.9 ft	Completion Depth:	20.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					FILL: push through road, no recovery.	1925
			CL		FILL - CLAY (CL): dark grayish brown; moist; with trace fine-medium grained sand mix within; high plasticity; 0% gravel, 5% sand, 95% fines.	
5			SC		CLAYEY SAND (SC): mostly fine grained with trace medium and coarse grained; subrounded; with few subrounded gravels; 10% gravel, 55% sand, 35% fines.	1920
			SP		9.5' SAND (SP): 3-inch lens of fine grained; tan; moist to wet.	
10			CL		SANDY CLAY (CL): dark gray; moist to wet; with fine to coarse sand and few gravels within, trace roots.	1915
			SM		SILTY SAND (SM): fine grained with few medium and coarse grained; grayish brown; saturated; with trace to few small subrounded gravels within; 10% gravel, 60% sand, 30% fines.	1910
			ML		SANDY SILT (ML): very fine to fine grained; light olive brown; wet to saturated; mottled.	
			CL-CH		LEAN TO FAT CLAY (CL-CH): olive yellow; moist; with golden brown mottles, trace manganese oxidation stains; medium plasticity.	
20					End of boring 20.0 feet	

Date Boring Started:	1/31/19 2:05 pm	Remarks:	WL: 10.20' bgs, not allowed to equilibrate
Date Boring Completed:	1/31/19 2:25 pm	Weather:	25°F, clear/sunny, windy
Logged By:	DJZ		
Drilling Contractor:	AET		
Drill Rig:	6620 DT		Additional data may have been collected in the field which is not included on this log.



Barr Engineering Company
 234 West Century Avenue
 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING T-1

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1914.6 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,474.2 ft E 3,584,051.4 ft	Completion Depth:	25.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						1914.6
0 - 3.5			SC		CLAYEY SAND (SC): fine grained few medium and coarse grained; subrounded; very dark grayish brown; frozen; with few small subrounded gravels; 10% gravel, 50% sand, 40% fines.	
3.5 - 4.5			CL		SILTY CLAY (CL): dark grayish brown; moist; 0% gravel, 0% sand, 100% fines.	1910
4.5 - 8.5			CL-CH		CLAY (CL-CH): dark grayish brown; moist; mottled with orange/red and gray; high plasticity; 0% gravel, 0% sand, 100% fines.	
8.5 - 9.0					8.5': color change to gray and dark gray.	
9.0 - 13.0					9.0': wet, fragments of black organics and lignite coal within.	1905
13.0 - 15.0					13': color change to grayish brown with mottles.	
15.0 - 20.0			CL		CLAY WITH SAND (CL): fine to medium grained; grayish brown; subrounded to subangular; wet to moist; 0% gravel, 25% sand, 75% fines.	1900
20.0 - 23.0			SW		SAND (SW): fine to coarse grained; wet; subrounded to subangular; well graded with gravels at contact.	1895
23.0 - 25.0			CL-CH		CLAY (CL-CH): Fort Union Formation; gray; moist; silt laminations as fractures within.	1890
25.0					End of boring 25.0 feet	

Date Boring Started: 1/31/19 3:10 pm
 Date Boring Completed: 1/31/19 4:20 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 0.99' bgs
 Weather: 25°F, partly cloudy, windy
 Additional data may have been collected in the field which is not included on this log.



Barr Engineering Company
 234 West Century Avenue
 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING T-2

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1911.9 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,725.2 ft E 3,584,548.7 ft	Completion Depth:	30.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			OL		CLAY WITH ORGANICS (OL): dark grayish brown; frozen; roots; medium plasticity; 0% gravel, 0% sand, 100% fines.	1910
5			CL		LEAN CLAY (CL): gray; moist to wet; soft; rusty/oxidized mottles; high plasticity; 0% gravel, 1% sand, 99% fines. 8': Darker gray with black organics, soft.	1905
10			CL-CH		CLAY (CL-CH): gray; moist to wet; soft; mottled with rusty golden spots; high plasticity; 0% gravel, 0% sand, 100% fines.	1900
15			SM		SILTY SAND (SM): very fine to fine grained; grayish brown; trace medium to coarse grained sand; 0% gravel, 60% sand, 40% fines.	1895
18			CL-CH		CLAY (CL-CH): grayish brown; moist to wet; trace medium grained sand, mottled with gray spots; high plasticity.	
20			SM		SILTY SAND (SM): very fine to fine grained; grayish brown; trace medium to coarse grained sand; 0% gravel, 60% sand, 40% fines.	
22			SW		WELL GRADED SAND (SW): fine to coarse grained; subrounded to subangular; small to large gravels, subrounded to subangular.	1890
24			CL-CH		CLAY (CL-CH): olive brown; wet; soft; fragments of wood/roots within.	
25			CH		LIGNITE: black; wet; horizontal layering. CLAY (CH): Fort Union Formation; gray to dark gray; moist; hard.	
28			CL-CH		CLAY (CL-CH): gray; moist; hard; 0% gravel, 5% sand, 95% fines, breaks on fine grained sand veins, horizontal and paper thin, possible silt laminations with fine sand.	1885
30					End of boring 30.0 feet	

Date Boring Started: 2/1/19 8:40 am
 Date Boring Completed: 2/1/19 12:30 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: Artesian conditions once rods removed, no temp well installed, borehole sealed with bentonite chips, pipes were used to verify that no bridging occurred.
 Weather: 25°F, partly cloudy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-3

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1915.0 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,671.5 ft E 3,584,884.7 ft	Completion Depth:	32.5 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					LEAN CLAY (CL): brown; frozen to moist; lenses of silt, roots, few mottles; high plasticity; weak HCl reaction; 0% gravel, 0% sand, 100% fines.	
5			CL			1910
			ML		SILT (ML): brown; moist to wet; soft; 0% gravel, 0% sand, 100% fines.	
			CL		SILTY CLAY (CL): brown; moist to wet; few gray mottles and thin gray silt laminations, trace orange medium to coarse grained sand; 0% gravel, 1% sand, 99% fines.	
10			CH		FAT CLAY (CH): pale brown; moist; frequent gray mottles; high plasticity; 0% gravel, 0% sand, 100% fines.	1905
15			ML		SANDY SILT (ML): very fine grained; light olive brown; wet; soft; no HCl reaction; 0% gravel, 35% sand, 65% fines.	1900
20			SM		SILTY SAND (SM): very fine to fine grained; light olive brown; wet to saturated; very soft; trace gravels; 2% gravel, 60% sand, 38% fines.	1895
25			SP		SAND (SP): fine grained with trace medium to coarse grained; brown; wet; subrounded; trace small subrounded gravels.	1890
			CL		CLAY TO SILTY CLAY (CL): light olive brown; moist; hard; gray mottles, black organic lenses with fragments of lignite and roots; medium plasticity; 0% gravel, 5% sand, 95% fines.	
30			CH		FAT CLAY (CH): Fort Union Formation; gray; moist; hard; black organics and fragments of lignite; lignite at bottom of sample, 32.5'.	1885
					End of boring 32.5 feet	

Date Boring Started: 1/1/19 10:40 am
 Date Boring Completed: 2/1/19 3:00 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 11.93' bgs, temp well removed prior to advancing past 20'.
 Weather: -5°F, clear/sunny, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-5

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1912.8 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,649.6 ft E 3,585,434.0 ft	Completion Depth:	20.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	S U C S U	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					FILL - CLAY (CL): grayish brown; frozen to moist; varying amounts of sand and gravels, fine to coarse grained, subrounded; weak HCl reaction; 15% gravel, 15% sand, 70% fines.	1910
5			CL		SILT (ML): brown; moist to wet; soft; fine grained silty sand lenses, areas of gray and rusty mottles; weak HCl reaction; 0% gravel, 10% sand, 90% fines.	1905
10			SP		SAND (SP): fine grained; brown; wet.	
15			ML-CL		SILTY CLAY & CLAYEY SILT (ML-CL): brown; wet; areas of gray and rusty mottles; weak HCl reaction.	1900
18.95			ML		SILT (ML): dark grayish brown; wet; soft; 0% gravel, 0% sand, 100% fines.	1895
20			CH		FAT CLAY (CH): Fort Union Formation; gray; wet; soft; high plasticity; 0% gravel, 0% sand, 100% fines.	
20					End of boring 20.0 feet	

Date Boring Started: 1/30/19 1:10 pm
 Date Boring Completed: 1/30/19 1:35 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 14.36' bgs
 Weather: 5°F, clear/sunny, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-6

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1916.8 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,437.8 ft E 3,585,340.5 ft	Completion Depth:	20.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					LEAN CLAY (CL): brown; frozen to moist; few subrounded gravels and few subrounded to subangular sands; 10% gravel, 5% sand, 85% fines.	1915
5			CL		SILTY CLAY (CL): brown; moist; trace subrounded gravels, few fine grained clayey sand lenses, loose; 5% gravel, 20% sand, 75% fines.	1910
10			ML		SILT (ML): brown; wet; areas of clay/clayey silt within; 0% gravel, 0% sand, 100% fines.	1905
15			SP		SAND (SP): fine grained; tan; wet; loose; 0% gravel, 90% sand, 10% fines.	
			SM		CLAYEY SAND (SM): fine grained; brown; wet; loose to soft; 0% gravel, 65% sand, 35% fines.	
			CH		FAT CLAY (CH): Fort Union Formation; light olive brown to dark yellow; wet; hard; 2% gravel, 0% sand, 98% fines, trace gravel or mudstone at 18'.	1900
20			CH		CARBONACEOUS CLAY (CH): black; moist; hard; lignite within.	
					End of boring 20.0 feet	

Date Boring Started: 1/30/19 2:20 pm
 Date Boring Completed: 1/30/19 2:40 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 17.52' bgs
 Weather: 5°F, cloudy, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-13

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1916.9 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,629.2 ft E 3,584,730.4 ft	Completion Depth:	22.5 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					CLAY (CL-CH): brown; frozen; few fine to coarse sand and gravel, subrounded; 10% gravel, 10% sand, 80% fines.	1915
			CL-CH			
			GP		GRAVELLY LENS (GP).	
5			ML-CL		SILT WITH CLAY (ML-CL): light yellowish brown; wet; interbedded silt and clay lenses with rusty mottles.	1910
10			ML-CL		SILTY CLAY (ML-CL): light yellowish brown to light gray; moist to wet; hard; mottles, trace coal; 0% gravel, 0% sand, 100% fines.	1905
15			CL-CH		LEAN TO FAT CLAY (CL-CH): Fort Union Formation; gray; moist to wet; frequent fine silt laminations.	1900
20			CL-CH		17.5'-22.5': water bearing silt lenses throughout.	1895
					End of boring 22.5 feet	

Date Boring Started: 1/30/19 9:15 am
 Date Boring Completed: 1/30/19 10:15 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 8.77' bgs
 Weather: -5°F, clear/sunny, windy
 Additional data may have been collected in the field which is not included on this log.

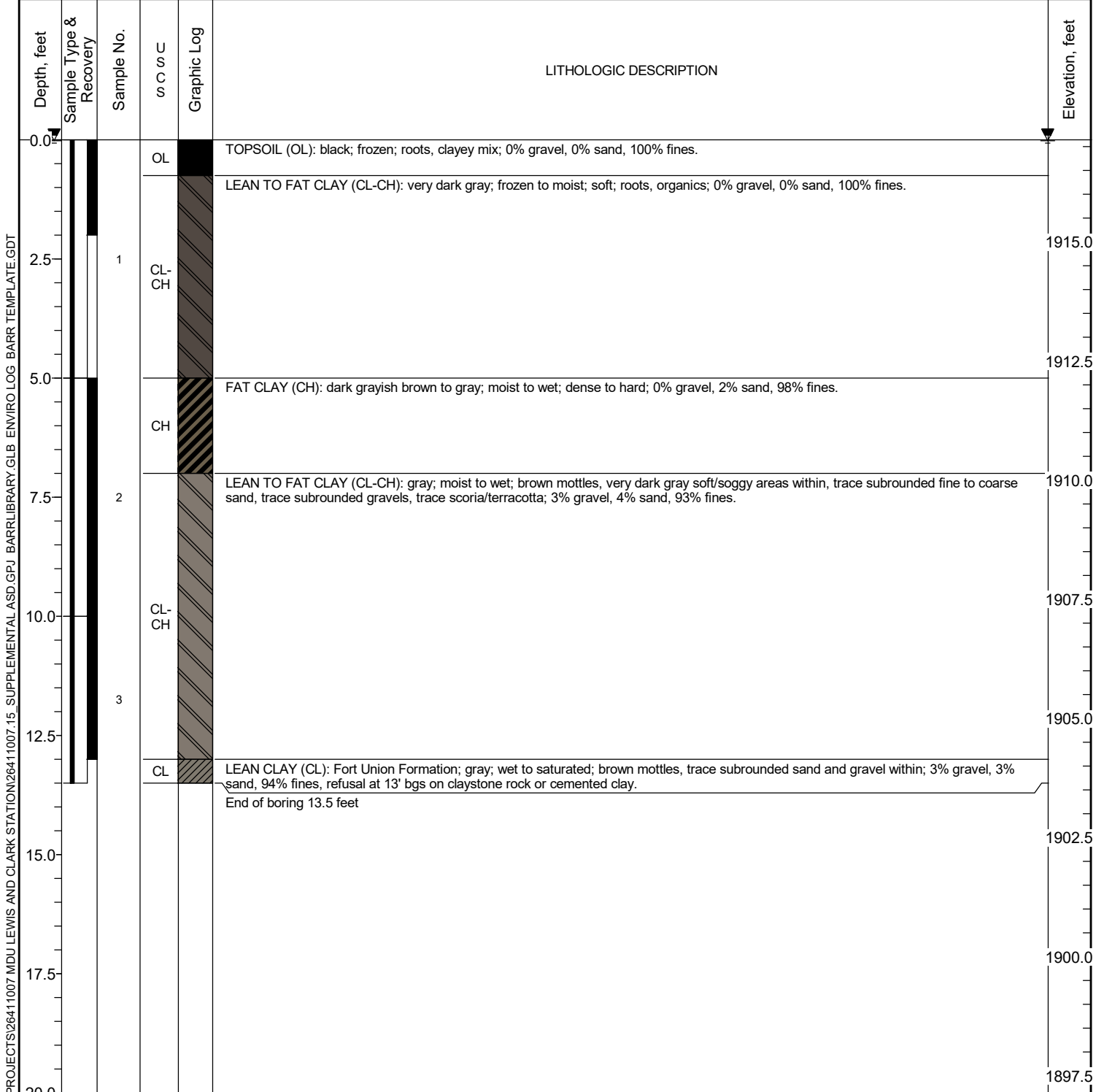


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LOG OF BORING T-14

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1917.1 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,679.6 ft E 3,583,153.0 ft	Completion Depth:	13.5 ft
Datum:	NAVD88		



Date Boring Started: 4/7/20 8:35 am
 Date Boring Completed: 4/7/20 9:05 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Refusal at 13.5' bgs - dense.
 Driller commented that 2-5' bgs was very soft (no push) - no recovery
 Temp well screen 3.5-13.5' bgs.
 Water at surface visible in bore hole/well.

Additional data may have been collected in the field which is not included on this log.

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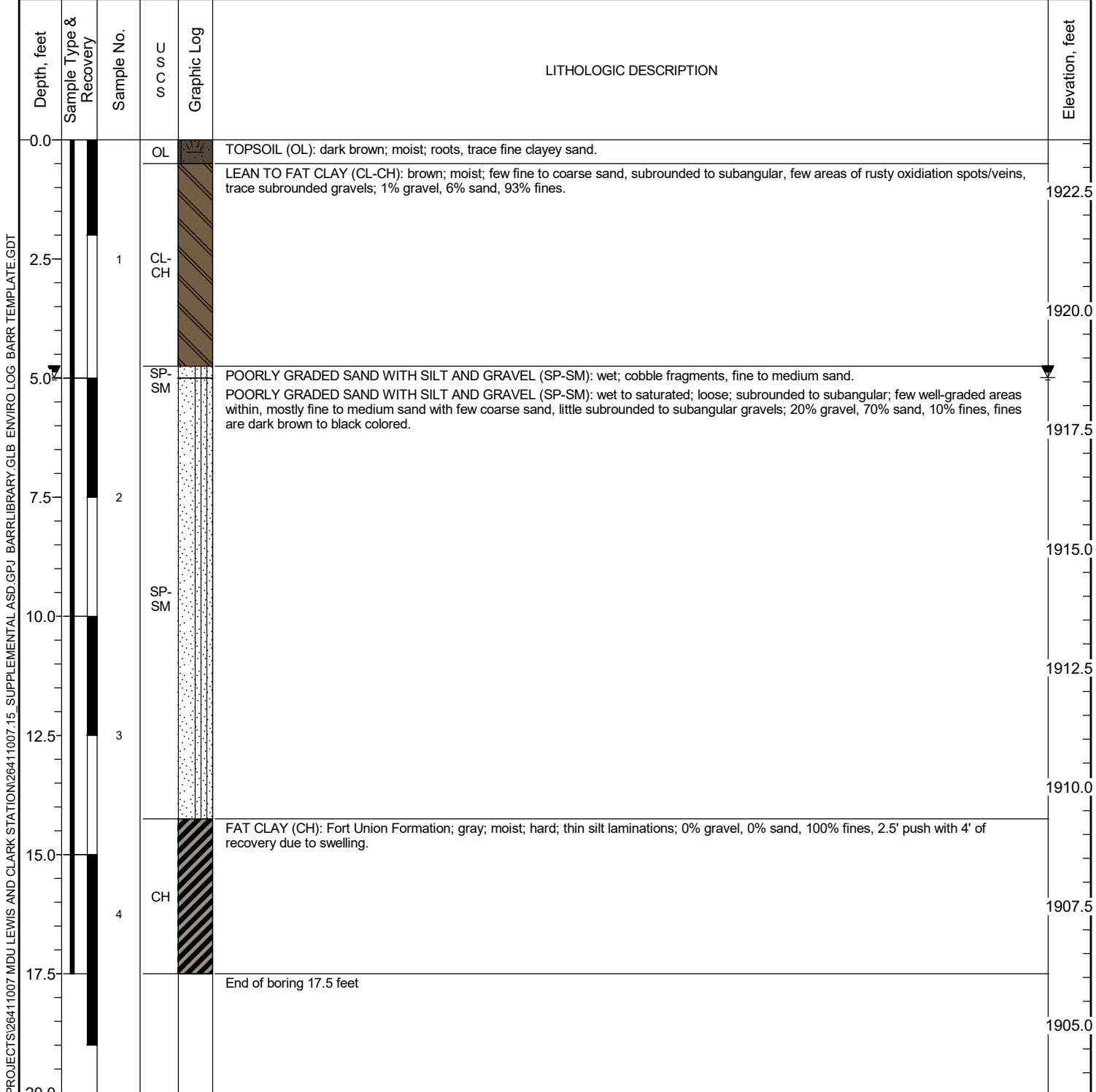


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LOG OF BORING T-15

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1923.6 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,244.4 ft E 3,583,085.3 ft	Completion Depth:	17.5 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 9:50 am
 Date Boring Completed: 4/6/20 10:30 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 1.5-11.5' bgs.
 Sand collapsed on screen.

Additional data may have been collected in the field which is not included on this log.

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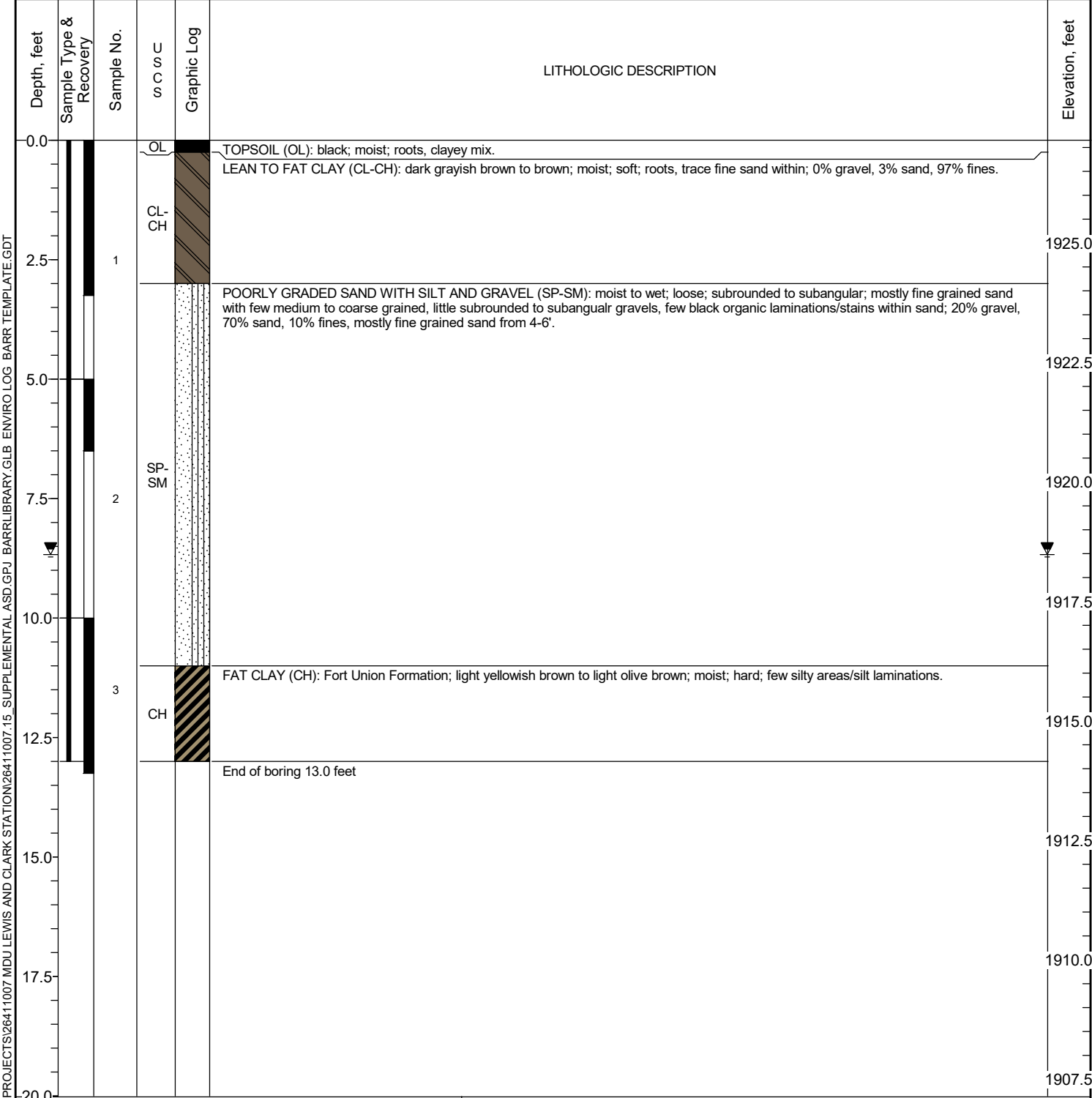


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LOG OF BORING T-16

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1927.2 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,247,812.4 ft E 3,583,130.0 ft	Completion Depth:	13.0 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 11:20 am
 Date Boring Completed: 4/6/20 12:10 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Refusal at 13' bgs, attempted second boring from offset location. Both pushes refused at 13' bgs.
 Temp well screen 8-13' bgs, expendable point used.
 Sand collapsed on screen.
 Additional data may have been collected in the field which is not included on this log.

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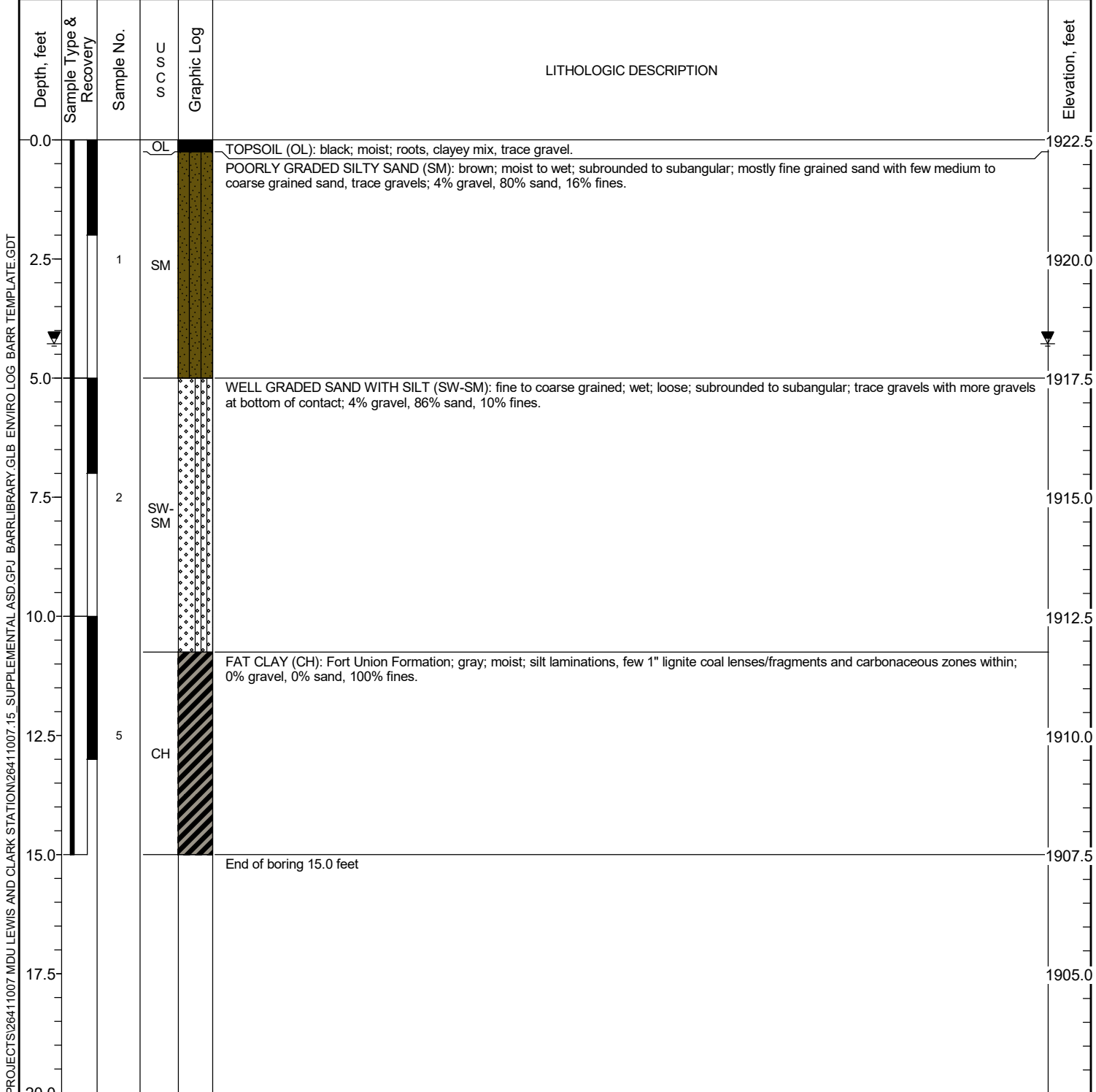


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LOG OF BORING T-17

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1922.5 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,336.3 ft E 3,583,522.5 ft	Completion Depth:	15.0 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 2:50 pm
 Date Boring Completed: 4/6/20 3:30 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 5-10' bgs, expendable point used. Sand collapsed on screen.

 Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING T-18

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD Surface Elevation: 1923.1 ft
 Project No.: 26411007.15 Drilling Method: Geoprobe Direct-Push
 Location: Lewis and Clark Station, Sidney, MT Sampling Method: Geoprobe
 Coordinates: N 2,247,982.1 ft E 3,583,479.1 ft
 Datum: NAVD88 Completion Depth: 14.5 ft

Depth, feet	Sample Type & Recovery	Sample No.	SSCSU	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0.0					FILL; SANDY LEAN CLAY (CL): black to very dark brown; moist; subrounded to subangular; roots, fine to coarse sand and trace gravels within, trace fragments of black coal within; 5% gravel, 30% sand, 65% fines.	1922.5
2.5		1	CL			1920.0
5.0					WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM): fine to coarse grained; wet to saturated; loose; subrounded to subangular; little gravels; 15% gravel, 75% sand, 10% fines, some areas near top of interval are poorly graded, less fines at 11-12.5'.	1917.5
7.5		2	SW-SM			1915.0
10.0						1912.5
12.5		3	CH		FAT CLAY (CH): Fort Union Formation; gray; moist; hard to dense; thin silt laminations within; 0% gravel, 0% sand, 100% fines, 1" lignite coal lense at 14'.	1910.0
15.0					End of boring 14.5 feet	1907.5
17.5						1905.0
20.0						

Date Boring Started: 4/6/20 1:10 pm
 Date Boring Completed: 4/6/20 1:55 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: No recovery & refusal at 10-14.5' bgs, attempted second boring from offset location which hit refusal at 14.5' bgs.
 Temp well screen 3.5-13.5' bgs, expendable point used.
 Sand collapsed on screen.
 Additional data may have been collected in the field which is not included on this log.

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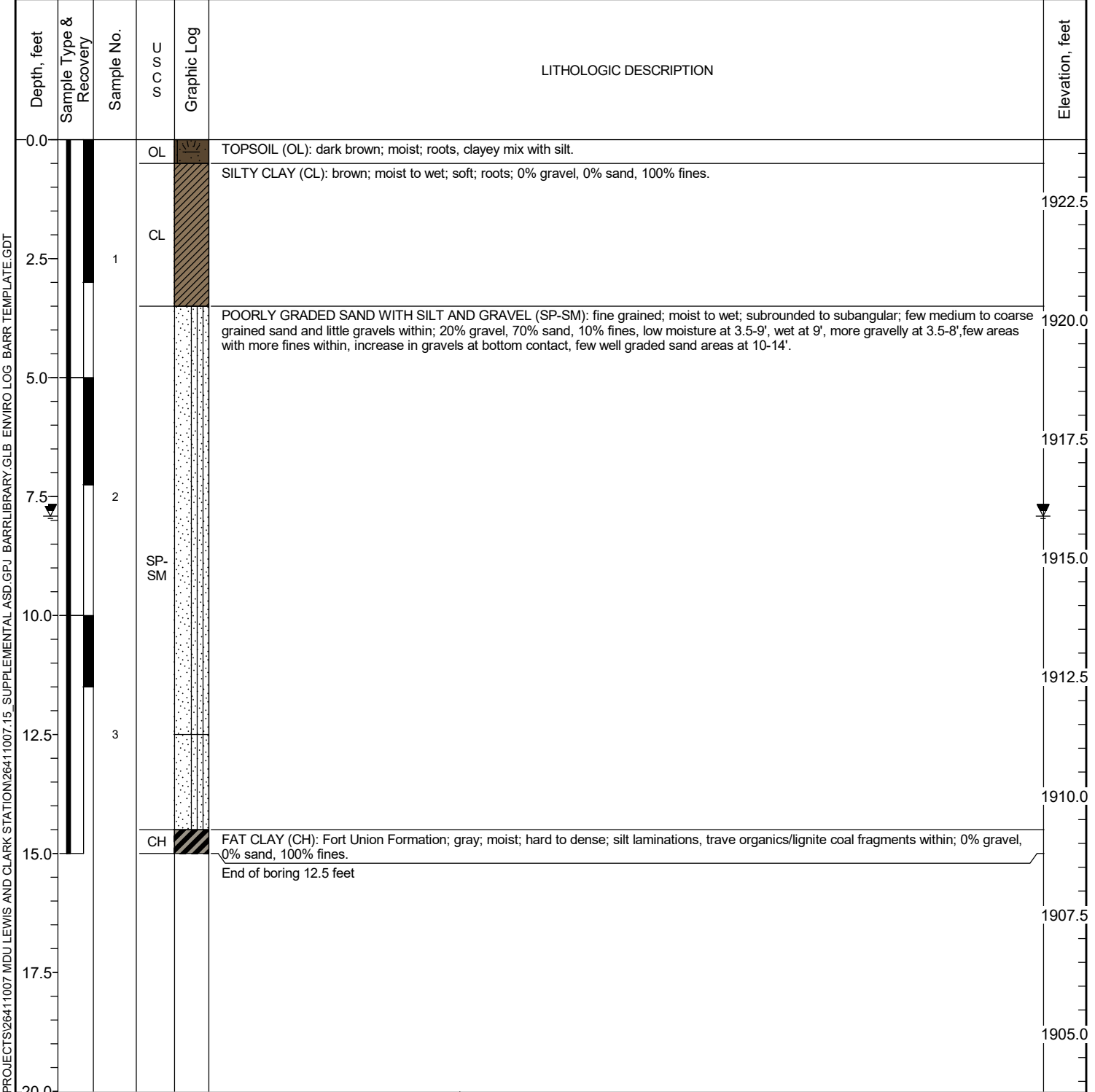
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LOG OF BORING T-19

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD
 Project No.: 26411007.15
 Location: Lewis and Clark Station, Sidney, MT
 Coordinates: N 2,246,894.0 ft E 3,583,802.3 ft
 Datum: NAVD88

Surface Elevation: 1923.8 ft
 Drilling Method: Geoprobe Direct-Push
 Sampling Method: Geoprobe
 Completion Depth: 12.5 ft



Date Boring Started: 4/6/20 5:20 pm
 Date Boring Completed: 4/6/20 6:00 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: No recovery 5-10' bgs, completed second boring from offset location.
 Temp well screen 9-14' bgs, expendable point used.
 Sand collapsed on screen.

Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING T-20

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1920.7 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,692.1 ft E 3,583,864.1 ft	Completion Depth:	15.0 ft
Datum:	NAVD88		

Depth, feet	Sample Type & Recovery	Sample No.	U S C S	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0.0			OL		TOPSOIL (OL): dark grayish brown; moist; roots, clayey mix.	1920.0
2.5		1	CL		SANDY LEAN CLAY (CL): fine to coarse grained; brown; moist; subrounded to subangular; trace gravels within; 5% gravel, 20% sand, 75% fines.	1917.5
5.0			CL-SC		POORLY GRADED SAND AND CLAY (CL-SC): fine grained; brown; moist; subrounded to subangular; few medium to coarse grained sand, few gravels; 10% gravel, 45% sand, 45% fines.	1915.0
7.5		2	CH		FAT CLAY (CH): light yellowish brown; moist; hard to dense; occasional brown and gray mottles, few black organic lenses/stains; 0% gravel, 0% sand, 100% fines.	1912.5
10.0		3	ML		SANDY SILT (ML): light olive yellow; wet to saturated; very fine grained sand within; 0% gravel, 40% sand, 60% fines, near liquid limit, sand and silt ratio varies with depth.	1910.0
12.5		4				1907.5
15.0					End of boring 15.0 feet	1905.0
17.5						1902.5
20.0						

Date Boring Started: 4/7/20 10:00 am
 Date Boring Completed: 4/7/20 10:30 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Refusal at 15' bgs.
 Temp well screen 5-15' bgs.

Additional data may have been collected in the field which is not included on this log.

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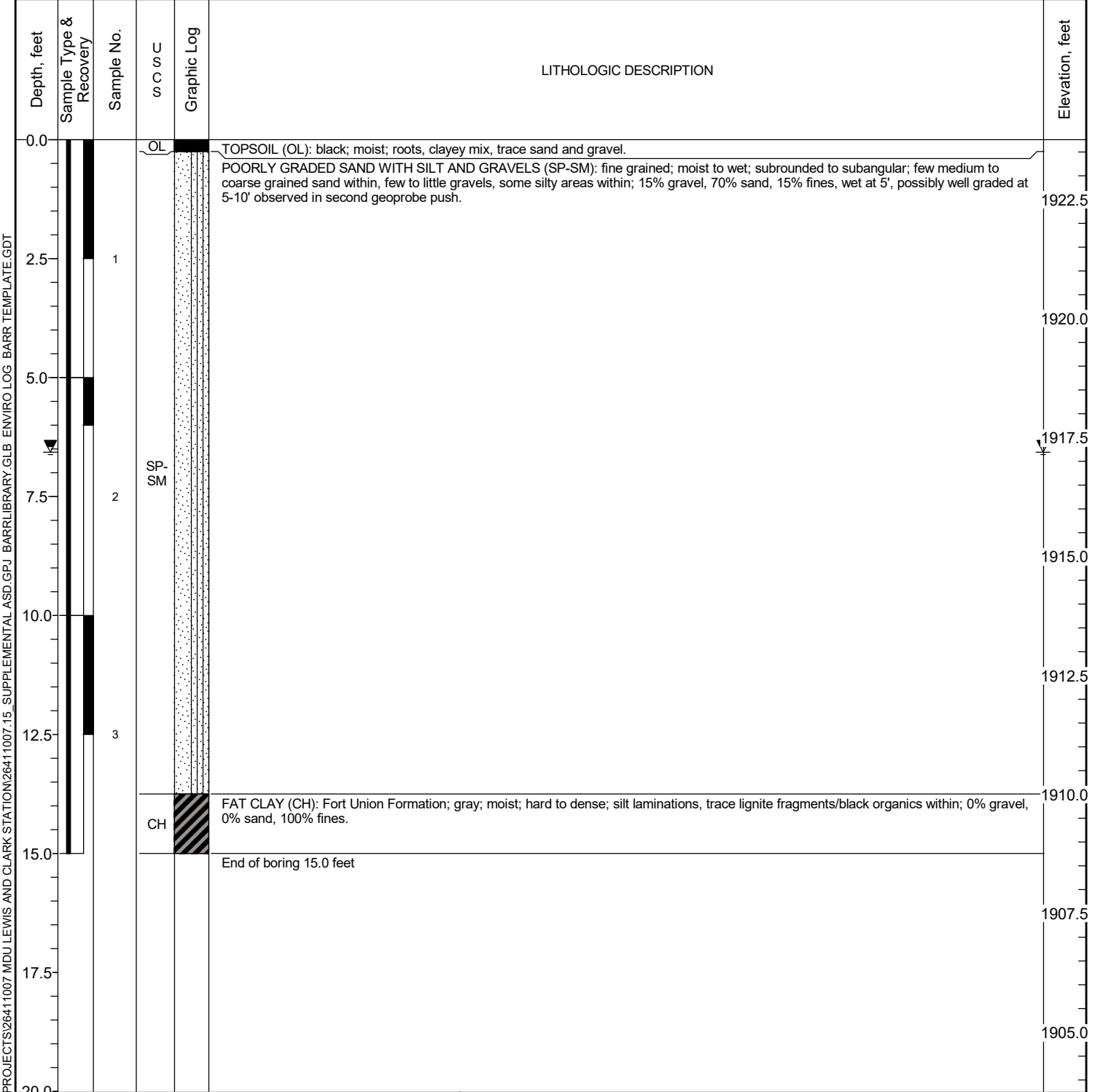


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LOG OF BORING T-21

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1923.8 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,182.0 ft E 3,584,028.4 ft	Completion Depth:	15.0 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 3:55 pm
 Date Boring Completed: 4/6/20 4:45 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 4-14' bgs, expendable point used.
 Second boring completed for additional sample recovery.

Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING T-22

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD
 Project No.: 26411007.15
 Location: Lewis and Clark Station, Sidney, MT
 Coordinates: N 2,248,814.6 ft E 3,584,890.5 ft
 Datum: NAVD88

Surface Elevation: 1912.6 ft
 Drilling Method: Geoprobe Direct-Push
 Sampling Method: Geoprobe
 Completion Depth: 20.0 ft

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					FILL; SANDY LEAN CLAY (CL): very dark gray to dark brown; moist; sand and gravel at surface - mixed within clay fill below surface; 10% gravel, 40% sand, 50% fines.	
1		1	CL			1910
5					FAT CLAY (CH): moist to wet; dense; hard and softer areas within, black organics and roots within; 0% gravel, 0% sand, 100% fines.	
2		2			8-9'; olive brown; more silty and saturated.	1905
10					9-12.5'; same as 3.5-8' but harder, soft at 12.5'; high plasticity.	
3		3	CH		12.5-14.5'; gray/dark gray to black; black organic/peat area with roots and shell fragments.	1900
15					14.5-15.5'; fine sand within the fat clay.	
4		4			15.5-20'; dark gray; wet, soft; high plasticity.	1895
20					End of boring 20.0 feet	

Date Boring Started: 4/7/20 11:35 am
 Date Boring Completed: 4/6/20 10:05 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 3.5-18.5' bgs.

Additional data may have been collected in the field which is not included on this log.



Barr Engineering Company
 234 West Century Avenue
 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING T-23

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1917.9 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,816.0 ft E 3,585,392.7 ft	Completion Depth:	15.0 ft
Datum:	NAVD88		

\\EDI-CAD\CAD\GINT\PROJECTS\26411007 MDU LEWIS AND CLARK STATION\26411007.15 SUPPLEMENTAL ASD.GPJ BARR\LIBRARY\GLB ENVIRO LOG BARR TEMPLATE.GDT

Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0.0			OL		TOPSOIL (OL): dark brown; moist; roots, clay with fine sand within.	1917.5
2.5		1	CL		SANDY LEAN CLAY (CL): very fine to fine grained; brown; moist; subangular to subrounded; trace medium to coarse sand, trace gravels; 4% gravel, 21% sand, 75% fines.	1915.0
5.0			ML		SANDY SILT (ML): pale olive to light yellowish brown; moist to wet; 0% gravel, 40% sand, 60% fines. 4.5-5.5'; dry/low moisture with areas of rusty oxidation stains throughout.	1912.5
7.5		2			6.5-8'; wet to saturated; gray mottles.	1910.0
10.0			ML		9.5-13.5'; areas of lean clay and silt laminations, trace siltstone fragments, dense/hard drilling.	1907.5
12.5		3				1905.0
15.0			CH		FAT CLAY (CH): olive yellow to light yellowish brown; moist; very hard to dense; mottled, with black organics or manganese oxidation stains; 0% gravel, 0% sand, 100% fines.	1902.5
15.0					End of boring 15.0 feet	1902.5
17.5						1900.0
20.0						

Date Boring Started:	4/7/20 1:10 pm	Remarks: Refusal at 15' bgs with very tough drilling from 10-15' bgs. Temp well screen 5-15' bgs. Borehole dry after temp well installed.
Date Boring Completed:	4/7/20 1:30 pm	
Logged By:	DJZ	
Drilling Contractor:	AET	
Drill Rig:		
		Additional data may have been collected in the field which is not included on this log.

Appendix B

Analytical Results



Date: 1/30/2020

CLIENT: Barr Engineering
Project: 26411007
Lab Order: S1912224

CASE NARRATIVE
Report ID: S1912224002
(Replaces S1912224001)

Samples SB-2, T-1, T-13 and T-2 were received on December 12, 2019.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

"Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

- S1912224-001 - SPLP/Lithium - Holding times for preparation or analysis exceeded
- S1912224-001 - SPLP/Selenium - Holding times for preparation or analysis exceeded
- S1912224-001 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
- S1912224-001 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
- S1912224-002 - SPLP/Lithium - Holding times for preparation or analysis exceeded
- S1912224-002 - SPLP/Selenium - Holding times for preparation or analysis exceeded
- S1912224-002 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
- S1912224-002 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
- S1912224-003 - SPLP/Lithium - Holding times for preparation or analysis exceeded
- S1912224-003 - SPLP/Selenium - Holding times for preparation or analysis exceeded
- S1912224-003 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
- S1912224-003 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
- S1912224-004 - SPLP/Lithium - Holding times for preparation or analysis exceeded
- S1912224-004 - SPLP/Selenium - Holding times for preparation or analysis exceeded
- S1912224-004 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
- S1912224-004 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
- S1912224-005 - SPLP/Lithium - Holding times for preparation or analysis exceeded
- S1912224-005 - SPLP/Selenium - Holding times for preparation or analysis exceeded
- S1912224-005 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
- S1912224-005 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
- S1912224-006 - SPLP/Lithium - Holding times for preparation or analysis exceeded
- S1912224-006 - SPLP/Selenium - Holding times for preparation or analysis exceeded
- S1912224-006 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
- S1912224-006 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded

Reviewed by:

Karen A Secor

Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/31/2019 10:00:00 AM

Project: 2641 1007
Lab ID: S1912224-001
Client Sample ID: SB-2
Depths: 2 - 5 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	11.5	0.2	H	mg/Kg	01/27/2020 1835 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1835 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1249 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1249 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/31/2019 10:05:00 AM

Project: 2641 1007
Lab ID: S1912224-002
Client Sample ID: SB-2
Depths: 10 - 20 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	4.9	0.2	H	mg/Kg	01/27/2020 1837 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1837 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1252 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1252 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/31/2019 3:20:00 PM

Project: 2641 1007
Lab ID: S1912224-003
Client Sample ID: T-1
Depths: 19 - 23 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	4.0	0.2	H	mg/Kg	01/27/2020 1839 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1839 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1254 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1254 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 2/1/2019 12:15:00 PM

Project: 2641 1007
Lab ID: S1912224-004
Client Sample ID: T-2
Depths: 23.5 - 30 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	18.1	0.2	H	mg/Kg	01/27/2020 1844 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1844 DG	EPA 6010C
SPLP						
Lithium	0.02	0.01	H	mg/L	01/09/2020 1256 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1256 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/30/2019 9:20:00 AM

Project: 2641 1007
Lab ID: S1912224-005
Client Sample ID: T-13
Depths: 3.5 - 10 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	16.2	0.2	H	mg/Kg	01/27/2020 1856 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1856 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1305 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1305 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/30/2019 10:10:00 AM

Project: 2641 1007
Lab ID: S1912224-006
Client Sample ID: T-13
Depths: 15 - 20 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	22.7	0.2	H	mg/Kg	01/27/2020 1902 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1902 DG	EPA 6010C
SPLP						
Lithium	0.02	0.01	H	mg/L	01/09/2020 1307 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1307 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

**ANALYTICAL QC SUMMARY REPORT**

CLIENT: Barr Engineering
Work Order: S1912224
Project: 26411007

Date: 1/30/2020
Report ID: S1912224002
 (Replaces S1912224001)

EPA 1312Sample Type **MBLK**

Units: mg/L

SPLP BLK (01/09/20 13:09)	RunNo: 175360							
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Lithium	ND	0.01						
Selenium	ND	0.2						

EPA 1312Sample Type **DUP**

Units: mg/L

S1912224-004AD (01/09/20 12:58)	RunNo: 175360							
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Lithium	0.03	0.01	0.02	54.8		20	HR	
Selenium	ND	0.2	ND			20	H	

Total (3050) Metals by ICP - 6010CSample Type **MBLK**

Units: mg/Kg

MB-17055 (01/27/20 17:49)	RunNo: 175797	PrepDate: 01/24/20 14:09	BatchID 17055					
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Lithium	ND	0.2						
Selenium	ND	1.3						

Total (3050) Metals by ICP - 6010CSample Type **LCS**

Units: mg/Kg

LCS-17055 (01/27/20 17:56)	RunNo: 175797	PrepDate: 01/24/20 14:09	BatchID 17055					
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Lithium	121	0.2	125		97.1	80 - 120		
Selenium	86.9	1.3	100		86.9	80 - 120		

Total (3050) Metals by ICP - 6010CSample Type **MS**

Units: mg/Kg

S1912224-004AS (01/27/20 18:51)	RunNo: 175797	PrepDate: 01/24/20 7:55	BatchID 17055					
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Lithium	136	0.2	125	18.1	94.0	75 - 125	H	
Selenium	90.5	1.3	100	ND	90.5	75 - 125	H	

Total (3050) Metals by ICP - 6010CSample Type **MSD**

Units: mg/Kg

S1912224-004AMSD (01/27/20 18:53)	RunNo: 175797	PrepDate: 01/24/20 7:55	BatchID 17055					
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual	
Lithium	132	0.2	136	2.55	91.3	20	H	
Selenium	88.8	1.3	90.5	1.88	88.8	20	H	

Total (3050) Metals by ICP - 6010CSample Type **DUP**

Units: mg/Kg

S1912224-003AD (01/27/20 18:42)	RunNo: 175797	PrepDate: 01/24/20 7:55	BatchID 17055					
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Lithium	4.1	0.2	4.0	0.415		20	H	
Selenium	ND	1.3	ND			20	H	

Qualifiers: B Analyte detected in the associated Method Blank
 G Analyzed at IML Gillette laboratory
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit
 R RPD outside accepted recovery limits
 X Matrix Effect

E Value above quantitation range
 H Holding times for preparation or analysis exceeded
 L Analyzed by another laboratory
 O Outside the Range of Dilutions
 S Spike Recovery outside accepted recovery limits



Date: 8/7/2020

CLIENT: Barr Engineering
Project: Sediment Saturated Paste Extracts
Lab Order: S2007298

CASE NARRATIVE
Report ID: S2007298001

Samples T-14 (10-13), T-14 (5-7), T-14 (7-10), T-15 (10-14.25), T-15 (5-10), T-16 (11-13), T-17 (10.75-15), T-17 (5-10.75), T-18 (10-12.5), T-18 (12.5-14.5), T-18 (5-10), T-19 (10-14.5), T-19 (3.5-5), T-19 (5-10), T-20 (12.5-15), T-20 (3.5-5.5), T-20 (8.25-12.5), T-21 (13.75-15), T-21 (5-13.75), T-22 (10-15), T-22 (15-20), T-22 (3.5-10), T-23 (10-13.5), T-23 (13.5-15) and T-23 (4.5-10) were received on July 21, 2020.

Samples T-15 (14.25-17.5), T-16 (3-11), T-20 (5.5-8.25) were originally received April 14, 2020 and samples were requested to be analyzed with the current received samples.

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

- U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
- American Society of Agronomy, Number 9, Part 2, 1982
- USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
- Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
- New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
- State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
- Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
- State of Nevada Modified Sobek Procedure
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

- SATPASTE QC - Saturated Paste Metals by ICP/Boron - Spike Recovery outside accepted recovery limits
- SATPASTE QC - Saturated Paste Metals by ICP/Selenium - Spike Recovery outside accepted recovery limits

Reviewed by: *Karen A Secor*

Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-001
Client Sample ID: T-14 (5-7)
Depths: 5 - 7 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 17:22 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:22 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:22 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-002
Client Sample ID: T-14 (7-10)
Depths: 7 - 10 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 17:24 DG	EPA 200.7
Lithium	0.04	0.01		ppm	08/04/2020 17:24 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:24 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-003
Client Sample ID: T-14 (10-13)
Depths: 10 - 13 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 17:27 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:27 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:27 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-004
Client Sample ID: T-15 (5-10)
Depths: 5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.5	0.1		ppm	08/04/2020 17:29 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:29 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:29 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-005
Client Sample ID: T-15 (10-14.25)
Depths: 10 - 14.25 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 17:31 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:31 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:31 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-006
Client Sample ID: T-16 (11-13)
Depths: 11 - 13 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 17:33 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:33 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:33 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-007
Client Sample ID: T-17 (5-10.75)
Depths: 5 - 10.75 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 17:36 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:36 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:36 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298
Collection Date:

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-008
Client Sample ID: T-17 (10.75-15)
Depths: 10.75 - 15 Feet

Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/06/2020 16:15 DG	EPA 200.7
Lithium	0.07	0.01		ppm	08/06/2020 16:15 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:15 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-009
Client Sample ID: T-18 (5-10)
Depths: 5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.5	0.1		ppm	08/04/2020 17:45 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:45 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:45 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-010
Client Sample ID: T-18 (10-12.5)
Depths: 10 - 12.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 17:47 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:47 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:47 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-011
Client Sample ID: T-18 (12.5-14.5)
Depths: 12.5 - 14.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	1.2	0.1		ppm	08/04/2020 17:49 DG	EPA 200.7
Lithium	0.14	0.01		ppm	08/04/2020 17:49 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:49 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-012
Client Sample ID: T-19 (3.5-5)
Depths: 3.5 - 5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 17:51 DG	EPA 200.7
Lithium	0.06	0.01		ppm	08/04/2020 17:51 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:51 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298
Collection Date:

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-013
Client Sample ID: T-19 (5-10)
Depths: 5 - 10 Feet

Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50062

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 17:54 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:54 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:54 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-014
Client Sample ID: T-19 (10-14.5)
Depths: 10 - 14.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 17:56 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:56 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:56 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-015
Client Sample ID: T-20 (3.5-5.5)
Depths: 3.5 - 5.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 17:58 DG	EPA 200.7
Lithium	0.04	0.01		ppm	08/04/2020 17:58 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:58 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298
Collection Date:

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-016
Client Sample ID: T-20 (8.25-12.5)
Depths: 8.25 - 12.5 Feet

Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50062

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 18:00 DG	EPA 200.7
Lithium	0.01	0.01		ppm	08/04/2020 18:00 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:00 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-017
Client Sample ID: T-20 (12.5-15)
Depths: 12.5 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 18:03 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 18:03 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:03 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-018
Client Sample ID: T-21 (5-13.75)
Depths: 5 - 13.75 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/06/2020 16:20 DG	EPA 200.7
Lithium	0.05	0.01		ppm	08/06/2020 16:20 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:20 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-019
Client Sample ID: T-21 (13.75-15)
Depths: 13.75 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 18:12 DG	EPA 200.7
Lithium	0.08	0.01		ppm	08/04/2020 18:12 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:12 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-020
Client Sample ID: T-22 (3.5-10)
Depths: 3.5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 18:14 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 18:14 DG	EPA 200.7
Selenium	0.14	0.05		ppm	08/04/2020 18:14 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-021
Client Sample ID: T-22 (10-15)
Depths: 10 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 18:16 DG	EPA 200.7
Lithium	0.10	0.01		ppm	08/04/2020 18:16 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:16 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-022
Client Sample ID: T-22 (15-20)
Depths: 15 - 20 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.5	0.1		ppm	08/04/2020 18:18 DG	EPA 200.7
Lithium	0.10	0.01		ppm	08/04/2020 18:18 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:18 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-023
Client Sample ID: T-23 (4.5-10)
Depths: 4.5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 18:21 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 18:21 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:21 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-024
Client Sample ID: T-23 (10-13.5)
Depths: 10 - 13.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 18:23 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 18:23 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:23 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298
Collection Date:

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-025
Client Sample ID: T-23 (13.5-15)
Depths: 13.5 - 15 Feet

Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50063

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 18:25 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 18:25 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:25 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-026
Client Sample ID: T-15 (14.25-17.5)
Depths: 14.25 - 17.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.1	0.1		ppm	08/06/2020 16:24 DG	EPA 200.7
Lithium	0.04	0.01		ppm	08/06/2020 16:24 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:24 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-027
Client Sample ID: T-16 (3-11)
Depths: 3 - 11 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/06/2020 16:31 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/06/2020 16:31 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:31 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-028
Client Sample ID: T-20 (5.5-8.25)
Depths: 5.5 - 8.25 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/06/2020 16:34 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/06/2020 16:34 DG	EPA 200.7
Selenium	0.09	0.05		ppm	08/06/2020 16:34 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering

Date: 8/7/2020

Work Order: S2007298

Report ID: S2007298001

Project: Sediment Saturated Paste Extracts

Saturated Paste Metals by ICP

Sample Type **MBLK**

Units: ppm

SATPASTE BLK (08/06/20 16:43)		RunNo: 181357						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	ND	0.1						
Lithium	ND	0.01						
Selenium	ND	0.05						

Saturated Paste Metals by ICP

Sample Type **LCS**

Units: ppm

SATPASTE QC (08/04/20 18:28)		RunNo: 181260						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	0.2	0.1	0.31		74.7	80 - 120	S	
Lithium	0.07	0.01	0.07		103	80 - 120		
Selenium	0.07	0.05	0.11		65.2	80 - 120	S	

QC-2 (08/06/20 16:40)		RunNo: 181357						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	0.2	0.1	0.31		76.5	80 - 120	S	
Lithium	0.07	0.01	0.07		98.2	80 - 120		
Selenium	0.12	0.05	0.11		106	80 - 120		

Saturated Paste Metals by ICP

Sample Type **DUP**

Units: ppm

S2007298-008AD (08/06/20 16:18)		RunNo: 181357						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.2	0.1	0.3	1.55		20		
Lithium	0.07	0.01	0.07	1.20		20		
Selenium	0.08	0.05	ND			20	R	

S2007298-018AD (08/06/20 16:22)		RunNo: 181357						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.3	0.1	0.3	3.28		20		
Lithium	0.05	0.01	0.05	0.167		20		
Selenium	ND	0.05	ND			20		

S2007298-028AD (08/06/20 16:36)		RunNo: 181357						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.2	0.1	0.2	7.47		20		
Lithium	0.02	0.01	0.02	0.0234		20		
Selenium	ND	0.05	0.09			20		

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits

- D Report limit raised due to dilution
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- X Matrix Effect

Chain of Custody for Air Canisters



- Ann Arbor
 Bismarck
 Duluth
 Hibbing
 Jefferson City
 Minneapolis

Sample Origination State:

- KS MO WI
 MI ND Other: MT
 MN SD

- Analysis Requested:
- TO-14 TO-15 TO-15SIM
 3C Other

COC Number: **No 50061**
 COC 1 of 3

- Lab Deliverable Contents:
 (check all that apply)
- Sample Data with QC
 TIC Library Search
 Sample Chromatograms
 Individual Canister Certification Data
 EDD:
 EQUIS EQUIS-LITE
 TIC results in EDD
 Other: _____

Matrix Code:
 AA = Ambient Air (Indoor/Outdoor)
 SV = Soil Vapor/Landfill Gas/SVE
 Other: _____

SEDIMENT 3 = SD

REPORT TO	INVOICE TO
Company: <u>BARR ENGINEERING</u>	Company:
Address: <u>234 W. CENTURY</u>	Address:
Name: <u>SCOTT KOROM</u>	Name: <u>SAME</u>
email: <u>SKOROM@barr.com</u>	email:
Copy to: <u>datamgt@barr.com</u>	P.O.:
Project Name:	Barr Project No.:

Location	Canister		Flow Controller Serial #	Vacuum		Collection Date (mm/dd/yyyy)	Collection Time		Total Time	Matrix Code	PID Reading (ppm/ppb)	Sample Comments
	Serial #	Size		Initial	Final		Start (hh:mm)	Stop (hh:mm)				
1. <u>T-14 (5-7')</u>	<u>52007298</u>	<u>001</u>				<u>4/2020</u>				<u>SD</u>		<u>SEE ATTACHED LETTER FOR DETAILS</u>
2. <u>T-14 (7-10')</u>				<u>002</u>						<u>SD</u>		
3. <u>T-14 (10-13')</u>				<u>003</u>						<u>SD</u>		
4. <u>T-15 (5-10')</u>				<u>004</u>						<u>SD</u>		
5. <u>T-15 (10-14.25')</u>				<u>005</u>						<u>SD</u>		
6. <u>T-16 (11-13')</u>				<u>006</u>						<u>SD</u>		
7. <u>T-17 (5-10.75')</u>				<u>007</u>						<u>SD</u>		
8. <u>T-17 (10.75-15')</u>				<u>008</u>						<u>SD</u>		
9. <u>T-18 (5-10')</u>				<u>009</u>						<u>SD</u>		
10. <u>T-18 (10-12.5')</u>				<u>010</u>						<u>SD</u>		

BARR USE ONLY		Relinquished by:		Date	Time	Received by:		Date	Time
Sampled by:		<u>SCOTT KOROM</u>		<u>7/17/20</u>		<u>KAREN SECN</u>		<u>7/20/20</u>	<u>1030</u>
Barr Proj. Manager:	<u>JEREMY GACNIK</u>	Relinquished by:		Date	Time	Received by:		Date	Time
Barr DQ Manager:		Samples Shipped VIA:				Air Bill Number:		Requested Due Date:	
Lab Name:		<input type="checkbox"/> Courier <input checked="" type="checkbox"/> Federal Express <input type="checkbox"/> Sampler <input type="checkbox"/> Other: _____						<input type="checkbox"/> Standard Turn Around Time <input type="checkbox"/> Rush _____ (mm/dd/yyyy)	
Lab Location:		Lab WO:		Custody Seal Intact ?					
				<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> None					

Distribution - White-Original: Accompanies Shipment to Laboratory; Yellow Copy: Include in Field Documents; Pink Copy: Send to Data Management Administrators.

Chain of Custody for Air Canisters

Sample Origination State:



- Ann Arbor Duluth Jefferson City
 Bismarck Hibbing Minneapolis

- KS MO WI
 MI ND Other: MT
 MN SD

- Analysis Requested:
 TO-14 TO-15 TO-15SIM
 3C Other

COC Number: **No 50062**
 COC 2 of 3

- Lab Deliverable Contents:
 (check all that apply)
 Sample Data with QC
 TIC Library Search
 Sample Chromatograms
 Individual Canister Certification Data
 EDD:
 EQUiS EQUiS-LITE
 TIC results in EDD
 Other: _____

Matrix Code:
 AA = Ambient Air (Indoor/Outdoor)
 SV = Soil Vapor/Landfill Gas/SVE
 Other: SD = SEDIMENTS

REPORT TO	INVOICE TO
Company: <u>BARR</u>	Company:
Address: <u>234 W. CENTURY</u>	Address:
Name: <u>SA SCOTT KOROM</u>	Name: <u>SCOTT KOROM</u>
email: <u>SKOROM@BARR.COM</u>	email:
Copy to: <u>datamgt@barr.com</u>	P.O.:
Project Name:	Barr Project No:

Location	Canister		Flow Controller Serial #	Vacuum		Collection Date (mm/dd/yyyy)	Collection Time		Total Time	Matrix Code	PID Reading (ppm/ppb)	Sample Comments
	Serial #	Size		Initial	Final		Start (hh:mm)	Stop (hh:mm)				
<u>2.11 T-18 (12.5-14.5')</u>	<u>520</u>	<u>07298</u>	<u>011</u>			<u>04/2020</u>				<u>SD</u>		<u>SEE ATTACHED LETTER</u>
<u>2.12 T-19 (3.5-5')</u>			<u>012</u>							<u>SD</u>		
<u>3.13 T-19 (5-10')</u>			<u>013</u>							<u>SD</u>		
<u>4.14 T-19 (10-14.5')</u>			<u>014</u>							<u>SD</u>		
<u>5.15 T-20 (3.5-5.5')</u>			<u>015</u>							<u>SD</u>		
<u>6.16 T-20 (8.25-12.5')</u>			<u>016</u>							<u>SD</u>		
<u>7.17 T-20 (12.5-15')</u>			<u>017</u>							<u>SD</u>		
<u>8.18 T-21 (5-13.75')</u>			<u>018</u>							<u>SD</u>		
<u>8.19 T-21 (13.75-15')</u>			<u>019</u>							<u>SD</u>		
<u>10.20 T-22 (3.5-10')</u>			<u>020</u>							<u>SD</u>		

BARR USE ONLY		Relinquished by:		Date	Time	Received by:		Date	Time
Sampled by:		<u>SCOTT KOROM</u>		<u>7/17/20</u>		<u>Karen</u>		<u>7600</u>	<u>1030</u>
Barr Proj. Manager:	<u>J. GACHIR</u>	Relinquished by:		Date	Time	Received by:		Date	Time
Barr DQ Manager:		Samples Shipped VIA:				Air Bill Number:		Requested Due Date:	
Lab Name:		<input type="checkbox"/> Courier <input type="checkbox"/> Federal Express <input type="checkbox"/> Sampler <input type="checkbox"/> Other: _____						<input type="checkbox"/> Standard Turn Around Time <input type="checkbox"/> Rush _____ (mm/dd/yyyy)	
Lab Location:		Lab WO:		Custody Seal Intact ?					
				<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> None					

Distribution - White-Original: Accompanies Shipment to Laboratory; Yellow Copy: Include in Field Documents; Pink Copy: Send to Data Management Administrators.

Chain of Custody for Air Canisters

Sample Origination State:



- Ann Arbor
 Bismarck
 Duluth
 Hibbing
 Jefferson City
 Minneapolis

- KS MO WI
 MI ND Other: MT
 MN SD

- Analysis Requested:
 TO-14 TO-15 TO-15SIM
 3C Other

COC Number: **No 50063**
 COC 3 of 3

REPORT TO	INVOICE TO
Company: <u>BARR</u>	Company:
Address: <u>234 W. CENTURY</u>	Address: <u>SAME</u>
Name: <u>SCOTT KORDON</u>	Name:
email: <u>SKORDON@BARR.COM</u>	email:
Copy to: <u>datamgt@barr.com</u>	P.O.:
Project Name:	Barr Project No.:

- Lab Deliverable Contents:
 (check all that apply)
 Sample Data with QC
 TIC Library Search
 Sample Chromatograms
 Individual Canister Certification Data
 EDD:
 EQUIS EQUIS-LITE
 TIC results in EDD
 Other:

Matrix Code:
 AA = Ambient Air (Indoor/Outdoor)
 SV = Soil Vapor/Landfill Gas/SVE
 Other: SD = SEDIMENTS

Location	Canister		Flow Controller Serial #	Vacuum		Collection Date (mm/dd/yyyy)	Collection Time		Total Time	Matrix Code	PID Reading (ppm/ppb)	Sample Comments
	Serial #	Size		Initial	Final		Start (hh:mm)	Stop (hh:mm)				
<u>2.21 T-22(10-15')</u>	<u>520072</u>	<u>98-021</u>			<u>04/20/20</u>					<u>SD</u>		<u>SEE ATTACHED LETTER</u>
<u>2.22 T-22(15-20')</u>				<u>022</u>						<u>SD</u>		
<u>2.23 T-23(4.5-10')</u>				<u>023</u>						<u>SD</u>		
<u>2.24 T-23(10-13.5')</u>				<u>024</u>						<u>SD</u>		
<u>2.25 T-23(13.5-15')</u>				<u>025</u>						<u>SD</u>		
6.												<u>SCOTT KORDON 701-335-3125</u>
7.												
8.												
9.												
10.												

BARR USE ONLY		Relinquished by: <u>SCOTT KORDON</u>	Date: <u>3/17/20</u>	Time: <u>1030</u>	Received by: <u>Karen Sea</u>	Date: <u>7/20/20</u>	Time: <u>1030</u>
Sampled by:		Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Barr Proj. Manager: <u>J. CASNIK</u>		Samples Shipped VIA:	<input type="checkbox"/> Courier <input type="checkbox"/> Federal Express <input type="checkbox"/> Sampler <input type="checkbox"/> Other:		Air Bill Number:	Requested Due Date: <input type="checkbox"/> Standard Turn Around Time <input type="checkbox"/> Rush (mm/dd/yyyy)	
Barr DQ Manager:		Lab Name:	Custody Seal Intact ? <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> None				
Lab Location:		Lab WO:					

Distribution - White-Original: Accompanies Shipment to Laboratory; Yellow Copy: Include in Field Documents; Pink Copy: Send to Data Management Administrators.



MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 North Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
2 North German St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
2616 East Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724
1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com



Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W185
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 14:50
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-3

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.45	units	NA	SM 4500 H+ B	31 Jan 19 14:50	
Lithium - Total	0.106	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll

CC
12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W187
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 11:00
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-7

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.31	units	NA	SM 4500 H+ B	31 Jan 19 11:00	
Temperature - Field	1.84	Degrees C	NA	SM 2550B	31 Jan 19 11:00	
Lithium - Total	0.148	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	0.0959	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 North Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W188
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 16:40
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-8

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	6.64	units	NA	SM 4500 H+ B	31 Jan 19 16:40	
Lithium - Total	0.165	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Cc
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W190
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 18:00
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-11

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.01	units	NA	SM 4500 H+ B	31 Jan 19 18:00	
Lithium - Total	0.650	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	0.1026	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

C
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W191
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 15:50
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-13

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.80	units	NA	SM 4500 H+ B	31 Jan 19 15:50	
Lithium - Total	0.121	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{cc} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W192
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 10:25
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-1

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	6.90	units	NA	SM 4500 H+ B	1 Feb 19 10:25	
Lithium - Total	0.048	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Cc
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W195
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 18:20
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-6

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	0.116 mg/l		0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005 mg/l		0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W196
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 18:00
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-12

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	0.270 mg/l		0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	0.0056 mg/l		0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W197
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: Duplicate

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	0.048 mg/l		0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005 mg/l		0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll

*CC
12 Feb 19*

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W198
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 15:20
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: Field Blank

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	< 0.02 mg/l		0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005 mg/l		0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
⊗ = Due to sample matrix # = Due to concentration of other analytes
: = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W199
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 15:30
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: Equipment Blank

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	< 0.02 mg/l		0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005 mg/l		0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Cc
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016

Quality Control Report

Lab IDs: 19-W185 to 19-W199

Project: MDU Lewis & Clark

Work Order: 201982-0201

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Result	Matrix Spike Rec %	Matrix Spike % Rec Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD Rec %	MSD/ Dup RPD	MSD/ Dup RPD Limit (<)	Known Rec (%)	Known % Rec Limits	Method Blank
Lithium - Total mg/l	0.400	99	80-120	0.400	19-W187	0.148	0.567	105	75-125	0.567	0.552	101	2.7	20	-	-	< 0.02
				0.400	19-W197	0.048	0.453	101	75-125	0.453	0.466	104	2.8	20	-	-	< 0.02
Selenium - Total mg/l	0.1000	106	80-120	0.400	19-W187	0.0959	0.5280	108	75-125	0.5280	0.5252	107	0.5	20	-	-	< 0.005
				0.100	19-W195	< 0.005	0.0968	97	75-125	0.0968	0.0939	94	3.0	20	-	-	< 0.005

Samples were received in good condition on 4 Feb 2019 at 1656.

Temperature upon receipt at the Bismarck laboratory was 2.5°C. Samples were received on ice and evidence of cooling had begun.

All samples were properly preserved unless noted here and/or flagged on the individual analytical laboratory report.

Approved methodology was followed for all sample analyses.

All acceptance criteria were met for calibration, method blanks, laboratory control samples, laboratory fortified matrix/duplicates unless noted here.

Approved by: C. Crutcher
 12 Feb 19



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W635
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 12:02
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-15
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.042 mg/l		0.020	6010D	15 Apr 20 11:09	MDE
Boron - Total	0.18 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

CC
Claudette K. Carroll | Jul 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
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! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W636
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 13:30
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-16
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.045 mg/l		0.020	6010D	15 Apr 20 11:09	MDE
Boron - Total	0.15 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by: Claudette K Carroll ^{CC} 1 Jul 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity † = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W637
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 15:45
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-18
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.044 mg/l		0.020	6010D	15 Apr 20 11:09	MDE
Boron - Total	0.13 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	0.0090 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

CC
Claudette K. Carroll 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W638
Work Order #:82-0830
Account #: 013200
Date Sampled: 6 Apr 20 16:45
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-17
Sample Site: MDU L&C

Temp at Receipt: 0.4C

Table with 6 columns: As Received Result, Method RL, Method Reference, Date Analyzed, Analyst. Rows include Metal Digestion, Lithium - Total, Boron - Total, and Selenium - Total.

Approved by:

Claudette K. Carroll 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W639
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 17:33
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-21
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.041 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.19 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll

CC
1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
: = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W640
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 19:10
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-19
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.036 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.16 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carrö ^{CL} 1 JUL 2020

Claudette K. Carrö, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity * = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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2616 East Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724
1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com



Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W642
Work Order #: 82-0830
Account #: 013200
Date Sampled: 7 Apr 20 12:45
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-20
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.070	mg/l	0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.21	mg/l	0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	< 0.005	mg/l	0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll ^{CC} 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W643
Work Order #: 82-0830
Account #: 013200
Date Sampled: 8 Apr 20 8:25
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-22
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.077 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.38 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	0.0077 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll

*CC
1 Jul 2020*

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W644
Work Order #: 82-0830
Account #: 013200
Date Sampled: 8 Apr 20 9:00
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-23
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	14 Apr 20	HT
Lithium - Total	0.535	mg/l	0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.58	mg/l	0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	0.0352	mg/l	0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll ^{CC}
1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity * = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W645
Work Order #: 82-0830
Account #: 013200
Date Sampled:
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-D
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.044 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.16 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

CC
Claudette K Carroll 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016

Quality Control Report - Amended

Lab IDs: 20-W635 to 20-W646

Project: 26411007.15

Work Order: 202082-0830

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Result	Matrix Spike Rec %	Matrix Spike % Rec Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD Rec %	MSD/ Dup RPD	MSD/ Dup RPD Limit (<)	Known Rec (%)	Known % Rec Limits	Method Blank
Boron - Total mg/l	0.40	92	80-120	0.400	20-D1057	0.32	0.75	108	75-125	0.75	0.75	108	0.0	20	-	-	< 0.1
	0.40	90	80-120	0.400	20-D1072	0.13	0.53	100	75-125	0.53	0.54	102	1.9	20	-	-	< 0.1
	0.40	92	80-120	0.400	20-D1132	1.56	2.04	120	75-125	2.04	1.97	102	3.5	20	-	-	< 0.1
	0.40	90	80-120	0.400	20-W638	0.16	0.57	102	75-125	0.57	0.57	102	0.0	20	-	-	< 0.1
	0.40	90	80-120	0.400	20-W646	< 0.1	0.31	78	75-125	0.31	0.30	75	3.3	20	-	-	< 0.1
Lithium - Total mg/l	0.400	102	80-120	0.400	20-W578	< 0.02	0.411	103	75-125	0.411	0.402	100	2.2	20	-	-	< 0.02
	0.400	99	80-120	0.400	20-W638	0.033	0.464	108	75-125	0.464	0.465	108	0.2	20	-	-	< 0.02
Selenium - Total mg/l	0.1000	101	80-120	0.400	20W635q	< 0.005	0.4034	101	75-125	0.4034	0.4102	103	1.7	20	-	-	< 0.005
				0.400	20W645q	< 0.005	0.4138	103	75-125	0.4138	0.4562	114	9.7	20	-	-	< 0.005

Samples were received in good condition on 9 Apr 2020 at 1505.

Temperature upon receipt at the Bismarck laboratory was 0.4°C.

All samples were properly preserved unless noted here and/or flagged on the individual analytical laboratory report.

All holding times were met.

Approved methodology was followed for all sample analyses.

All acceptance criteria were met for calibration, method blanks, laboratory control samples, laboratory fortified matrix/duplicates unless noted here.

Per email from Terri Olson with Barr dated 11 Jun 2020, selenium was added to the samples.

Approved by: _____

C. Cantello

1 Jul 2020

Claudette Carroll

From: Terri A. Olson <TOlson@barr.com>
Sent: Thursday, June 11, 2020 11:15 AM
To: Claudette Carroll
Subject: RE: 202082-0830 BARR.pdf

Hi Claudette,

Glad that Scott requested this. Please analyze selenium by EPA 6020B on all 10 samples.

Thanks Claudette.

Terri A. Olson
Senior Data Quality Specialist
Minneapolis, MN office: 952.842.3578
TOlson@barr.com
www.barr.com

resourceful. naturally.



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From: Claudette Carroll <ccarroll@mvtl.com>
Sent: Thursday, June 11, 2020 9:46 AM
To: Terri A. Olson <TOlson@barr.com>
Subject: RE: 202082-0830 BARR.pdf

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Terri,

Cost of selenium would be \$18 per sample. Per an earlier request by Scott Korum, we have held onto these samples and will be able to run them for selenium, if requested.

Claudette



**Minnesota Valley Testing
Laboratories, Inc.**

Providing Analytical Excellence Since 1951

ccarroll@mvtl.com
701-258-9720

2616 E. Broadway Ave/Bismarck, ND 58501
#NDSmart, #NDStrong, #InThisTogether

From: Terri A. Olson <TOlson@barr.com>
Sent: Thursday, June 11, 2020 8:17 AM
To: Claudette Carroll <ccarroll@mvtl.com>
Subject: 202082-0830 BARR.pdf

Hi Claudette,

We are thinking about having selenium analyzed for the samples in the attached report. Do you have any sample left? Based on past work, I believe we would want the selenium by 6020 and the B and Li were by 6010 so reporting from the same run isn't an optino. If you have sample, what would be the associated cost for Se by 6020?

Thank-you,

Terri A. Olson
Senior Data Quality Specialist
Minneapolis, MN office: 952.842.3578
TOlson@barr.com
www.barr.com

resourceful. naturally.



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Date: 8/26/2020

CLIENT: Barr Engineering
Project: 26411007.15
Lab Order: S2008131

CASE NARRATIVE
Report ID: S2008131001

Samples COAL PILE COAL 2, SB-2 20.5-21, T-17 10.75-15, T-18 12.5-14.5, T-2 22.5-23.5, T-22 10-15, T-3 30-32.5, T-5 10-15 and T-6 19.5-20 were received on August 6, 2020.

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

- U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
- American Society of Agronomy, Number 9, Part 2, 1982
- USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
- Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
- New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
- State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
- Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
- State of Nevada Modified Sobek Procedure
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

SATPASTE QC - Saturated Paste Metals by ICP/Boron - Spike Recovery outside accepted recovery limits

Please note that during sample preparation for total metals analysis, a standard was used which did not contain lithium. This was not discovered until the samples were analyzed on August 25. Therefore, there is no spike QC data for lithium, but all QC for boron and selenium are present and acceptable.

Reviewed by:

Karen A Secor

Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-001
Client Sample ID: SB-2 20.5-21
Depths: 20.5 - 21 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	9.4	0.1		ppm	08/20/2020 16:17 DG	EPA 200.7
Lithium	0.11	0.01		ppm	08/20/2020 16:17 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/20/2020 16:17 DG	EPA 200.7
Total Metals-3050/6010						
Boron	59	5		mg/Kg	08/25/2020 15:46 DG	EPA 6010C
Lithium	1.8	0.2		mg/Kg	08/25/2020 15:46 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 15:46 DG	EPA 6010C

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-002
Client Sample ID: T-2 22.5-23.5
Depths: 22.5 - 23.5 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	3.2	0.1		ppm	08/20/2020 16:19 DG	EPA 200.7
Lithium	0.07	0.01		ppm	08/20/2020 16:19 DG	EPA 200.7
Selenium	0.13	0.05		ppm	08/20/2020 16:19 DG	EPA 200.7
Total Metals-3050/6010						
Boron	42	5		mg/Kg	08/25/2020 15:50 DG	EPA 6010C
Lithium	5.0	0.2		mg/Kg	08/25/2020 15:50 DG	EPA 6010C
Selenium	2.9	1.3		mg/Kg	08/25/2020 15:50 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-003
Client Sample ID: T-3 30-32.5
Depths: 30 - 32.5 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	1.5	0.1		ppm	08/20/2020 16:21 DG	EPA 200.7
Lithium	0.13	0.01		ppm	08/20/2020 16:21 DG	EPA 200.7
Selenium	0.07	0.05		ppm	08/20/2020 16:21 DG	EPA 200.7
Total Metals-3050/6010						
Boron	33	5		mg/Kg	08/25/2020 15:59 DG	EPA 6010C
Lithium	13.4	0.2		mg/Kg	08/25/2020 15:59 DG	EPA 6010C
Selenium	3.1	1.3		mg/Kg	08/25/2020 15:59 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-004
Client Sample ID: T-5 10-15
Depths: 10 - 15 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.8	0.1		ppm	08/20/2020 16:24 DG	EPA 200.7
Lithium	0.09	0.01		ppm	08/20/2020 16:24 DG	EPA 200.7
Selenium	0.06	0.05		ppm	08/20/2020 16:24 DG	EPA 200.7
Total Metals-3050/6010						
Boron	33	5		mg/Kg	08/25/2020 16:02 DG	EPA 6010C
Lithium	15.9	0.2		mg/Kg	08/25/2020 16:02 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:02 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-005
Client Sample ID: T-6 19.5-20
Depths: 19.5 - 20 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/20/2020 16:26 DG	EPA 200.7
Lithium	0.08	0.01		ppm	08/20/2020 16:26 DG	EPA 200.7
Selenium	0.09	0.05		ppm	08/20/2020 16:26 DG	EPA 200.7
Total Metals-3050/6010						
Boron	25	5		mg/Kg	08/25/2020 16:04 DG	EPA 6010C
Lithium	18.8	0.2		mg/Kg	08/25/2020 16:04 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:04 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-006
Client Sample ID: T-17 10.75-15
Depths: 10.75 - 15 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	2.2	0.1		ppm	08/20/2020 16:30 DG	EPA 200.7
Lithium	0.10	0.01		ppm	08/20/2020 16:30 DG	EPA 200.7
Selenium	0.06	0.05		ppm	08/20/2020 16:30 DG	EPA 200.7
Total Metals-3050/6010						
Boron	44	5		mg/Kg	08/25/2020 16:06 DG	EPA 6010C
Lithium	13.3	0.2		mg/Kg	08/25/2020 16:06 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:06 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-007
Client Sample ID: T-18 12.5-14.5
Depths: 12.5 - 14.5 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	3.3	0.1		ppm	08/20/2020 16:32 DG	EPA 200.7
Lithium	0.09	0.01		ppm	08/20/2020 16:32 DG	EPA 200.7
Selenium	0.07	0.05		ppm	08/20/2020 16:32 DG	EPA 200.7
Total Metals-3050/6010						
Boron	47	5		mg/Kg	08/25/2020 16:08 DG	EPA 6010C
Lithium	12.6	0.2		mg/Kg	08/25/2020 16:08 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:08 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-008
Client Sample ID: T-22 10-15
Depths: 10 - 15 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.9	0.1		ppm	08/20/2020 16:35 DG	EPA 200.7
Lithium	0.06	0.01		ppm	08/20/2020 16:35 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/20/2020 16:35 DG	EPA 200.7
Total Metals-3050/6010						
Boron	34	5		mg/Kg	08/25/2020 16:10 DG	EPA 6010C
Lithium	12.4	0.2		mg/Kg	08/25/2020 16:10 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:10 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-009
Client Sample ID: COAL PILE COAL 2
Depths: 0 - 0 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	2.6	0.1		ppm	08/20/2020 16:37 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/20/2020 16:37 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/20/2020 16:37 DG	EPA 200.7
Total Metals-3050/6010						
Boron	63	5		mg/Kg	08/25/2020 16:15 DG	EPA 6010C
Lithium	1.3	0.2		mg/Kg	08/25/2020 16:15 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:15 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
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- C Calculated Value
- E Value above quantitation range
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- ND Not Detected at the Reporting Limit
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- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering

Date: 8/26/2020

Work Order: S2008131

Report ID: S2008131001

Project:

Saturated Paste Metals by ICP

Sample Type **MBLK**

Units: ppm

SATPASTE BLK (08/20/20 16:46)		RunNo: 181804						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	ND	0.1						
Lithium	ND	0.01						
Selenium	ND	0.05						

Saturated Paste Metals by ICP

Sample Type **LCS**

Units: ppm

SATPASTE QC (08/20/20 16:44)		RunNo: 181804						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	0.4	0.1	0.31		124	80 - 120	S	
Lithium	0.08	0.01	0.07		116	80 - 120		
Selenium	0.10	0.05	0.11		86.7	80 - 120		

Saturated Paste Metals by ICP

Sample Type **DUP**

Units: ppm

S2008131-005AD (08/20/20 16:28)		RunNo: 181804						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.6	0.1	0.6	7.17		20		
Lithium	0.08	0.01	0.08	5.44		20		
Selenium	0.07	0.05	0.09	24.9		20	R	

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits

- D Report limit raised due to dilution
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- X Matrix Effect



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering
Work Order: S2008131
Project:

Date: 8/26/2020
Report ID: S2008131001

Total (3050) Metals by ICP - 6010C

Sample Type **MBLK**

Units: mg/Kg

MB-17637 (08/25/20 14:57)	RunNo: 181916	PrepDate: 08/20/20 17:23	BatchID 17637				
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Boron	ND	5					
Lithium	ND	0.2					
Selenium	ND	1.3					

Total (3050) Metals by ICP - 6010C

Sample Type **LCS**

Units: mg/Kg

LCS-17637 (08/25/20 14:59)	RunNo: 181916	PrepDate: 08/20/20 17:23	BatchID 17637				
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Boron	47	5	50		93.9	80 - 120	
Selenium	48.8	1.3	50		97.6	80 - 120	

Total (3050) Metals by ICP - 6010C

Sample Type **MS**

Units: mg/Kg

S2008131-009AS (08/25/20 16:17)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Boron	108	5	50	63	91.2	75 - 125	
Selenium	41.2	1.3	50	ND	82.4	75 - 125	

Total (3050) Metals by ICP - 6010C

Sample Type **MSD**

Units: mg/Kg

S2008131-009AMSD (08/25/20 16:26)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
Boron	105	5	108	2.88	85.0	20	
Selenium	40.0	1.3	41.2	2.96	80.0	20	

Total (3050) Metals by ICP - 6010C

Sample Type **DUP**

Units: mg/Kg

S2008131-001AD (08/25/20 15:48)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Boron	61	5	59	3.10		20	
Lithium	1.7	0.2	1.8	6.08		20	
Selenium	1.5	1.3	ND			20	R

S2008131-008AD (08/25/20 16:13)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Boron	36	5	34	4.95		20	
Lithium	12.9	0.2	12.4	3.79		20	
Selenium	ND	1.3	ND			20	

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - ND Not Detected at the Reporting Limit
 - R RPD outside accepted recovery limits
 - X Matrix Effect



Alternative Source Demonstration (ASD) for Lithium, Spring 2023

Lewis & Clark Station

Prepared for
Montana-Dakota Utilities Co.

November 2023

Alternative Source Demonstration (ASD) for Lithium, Spring 2023 Lewis & Clark Station

November 2023

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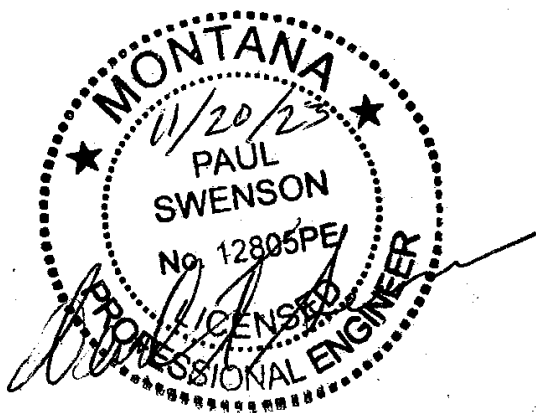
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Certification

I hereby certify that the written demonstration provided herein, supported by the data in the referenced documents, is accurate and consistent with our review of the groundwater and other data collected to date, as required under the CCR Rule (§257.95(g)(3)(ii)). Based on this review I have determined that a source other than the CCR unit regulated under the CCR Rule at the Site caused the statistically significant increases over the applicable groundwater protection standards (GWPS) for lithium in wells that are downgradient from that unit.



Paul Swenson, P.E.
PE #: 12805PE

November 20, 2023

Date

1 Introduction

Montana-Dakota Utilities Co. (MDU) operated a coal-fired electrical generation plant at the Lewis & Clark Station (Site) near Sidney, Montana. Operation of the plant resulted in coal combustion residuals (CCR) as a by-product. Management of CCR at the Site is subject to regulation under 40 CFR Part 257, Disposal of Coal Combustion Residuals From Electric Utilities (the CCR Rule).

Since the 1970s, CCR has been managed at the Site at various CCR management facilities. In particular:

- In 1975, two unlined surface impoundments were constructed on the Site. Based on available historical data, it appears that construction of the ponds involved excavating materials down to the Ft. Union Formation (Barr, 2016; Barr, 2019b), meaning that the sides of the surface impoundments were likely in direct contact with the aquifer. These surface impoundments were closed before the CCR Rule was promulgated, and therefore are not regulated under the CCR Rule.
- In 1993, clay-lined scrubber ponds were constructed generally in the footprint of the unlined surface impoundments, described above, with base elevations that were higher than the base elevations of the former surface impoundments. Once these scrubber ponds became operational, MDU started placing solid materials from them on top of a temporary storage pad (TSP) at the Site. In particular, the TSP stored flue-gas desulfurization (FGD) solids (excavated from the scrubber ponds) where it drained prior to loading and hauling for off-site disposal. The locations of these former scrubber ponds and former TSP are shown on Figure 1. These ponds were in existence on the effective date of the CCR Rule. Throughout this report, they are referred to as the “former Scrubber Ponds.”
- In 1998, the TSP was retrofitted with a geomembrane liner.
- In 2018, the former Scrubber Ponds were retrofitted with a composite liner with a small lateral expansion of each pond to the northeast, with base elevations that were higher than the original 1993 construction.
- In 2020, the lined TSP was closed using the closure-by-removal method after the Alternative Source Demonstration (ASD), Temporary Storage Pad, Lewis & Clark Station (Barr, 2020a) was completed. The current TSP is not regulated by the CCR Rule.
- In 2022, closure construction was completed on the lined Scrubber Ponds. Closure construction included removal of CCR from the ponds, removal of liner materials, filling the excavation with soil, and regrading the area to drain. The unregulated TSP was also removed in 2022.

The currently regulated CCR unit is the former Scrubber Ponds, a single, multi-unit CCR surface impoundment. The closed TSP is a former regulated CCR unit.

Statistically significant increases of appendix III parameters were detected under the detection monitoring program and the site transitioned to assessment monitoring on April 14, 2018. A determination was made on January 2, 2019, that selenium and lithium were detected in downgradient wells at statistically significant levels above groundwater protection standards (GWPS). An assessment of corrective measures was initiated on April 2, 2019. A downward trend in selenium concentrations was observed in monitoring results. Selenium levels have been below statistically significant levels above GWPS since April 2020. MDU continued to pursue an ASD for these constituents in parallel with ongoing corrective action measures. A successful ASD was published in January 2021 addressing both lithium and selenium. Each monitoring event since has been evaluated under the same approach as was used for the 2020 ASD, but recent ASDs have not evaluated selenium as it is no longer measured at statistically significant levels above GWPS. This ASD has been prepared for the results obtained during the Spring 2023 monitoring event.

1.1 Purpose

Assessment monitoring at the Site identified lithium concentrations in downgradient wells at statistically significant levels (SSLs) over site groundwater protection standards (GWPS) for the Spring 2023 monitoring event. According to the CCR Rule, Section § 257.95(g)(3)(ii), the Owner may:

Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer.

This report provides written documentation of an Alternative Source Demonstration (ASD) supporting continuation of assessment monitoring in accordance with § 257.95(g)(3)(ii) of the CCR Rule.

An ASD was prepared in January 2021 (Appendix C of the 2020 Annual Groundwater Monitoring and Corrective Action Report (Barr, 2021)), ending the selection of remedy phase of remediation activities for the Site. Data collected during the assessment monitoring event in April 2023 (Table 1) have been reviewed and an SSL for lithium has been identified. It has been determined that the ASD analysis conducted in 2021 continues to provide a rationale for a source other than the CCR unit causing the exceedance of GWPS in downgradient wells.

Exceedances of GWPS were identified for the parameters and at the following monitoring wells downgradient of the former Scrubber Ponds during the spring 2023 semi-annual assessment monitoring event completed between April 24 and April 25, 2023:

- MW111 – lithium
- MW117 – lithium
- MW118 – lithium
- MW120 – lithium

Table 1 Summary of Measured Lithium Concentrations Compared to Groundwater Protection Standards

Sampling Event	Monitoring Well	Lithium (mg/L)	Lithium GWPS
Assessment Monitoring – 2023 #1 (Spring)	MW111	0.158	0.0631*
	MW117	0.107	
	MW118	0.065	
	MW120	0.109	
Assessment Monitoring – 2022 #2 (Fall)	MW111	0.225	0.0631*
	MW117	0.122	
	MW118	0.084	
	MW120	0.176	
Assessment Monitoring – 2022 #1 (Spring)	MW111	0.166	0.0631*
	MW117	0.118	
	MW118	0.068	
	MW120	0.129	
Assessment Monitoring – 2021 #2 (Fall)	MW111	0.194	0.0631*
	MW117	0.115	
	MW118	0.082	
	MW120	0.135	
Assessment Monitoring – 2021 #1 (Spring)	MW111	0.158	0.0631*
	MW117	0.110	
	MW118	0.068	
	MW120	0.120	
Assessment Monitoring – 2020 #2 (Fall)	MW111	0.227	0.0678
	MW117	0.135	
	MW118	0.095	
	MW120	0.135	
Assessment Monitoring – 2020 #1 (Spring)	MW111	0.190	0.0678
	MW117	0.130	
	MW118	0.085	
	MW120	0.145	

* GWPS for lithium updated in Spring 2021 with collection of new upgradient monitoring data. Additional assessment monitoring lithium concentrations are included in the 2018 and 2019 Annual Groundwater Monitoring and Corrective Action Reports (Barr, 2019a, 2020b).

1.2 Scope of Work

As part of the ASD, site data were evaluated to determine whether the regulated CCR unit caused the SSIs over background levels for lithium in downgradient monitoring wells. As part of this evaluation, two hypotheses were developed and then tested with lines of evidence based on site data to determine if those hypotheses were valid. The evidence confirms that the SSLs were caused by a natural variation in groundwater quality rather than the former Scrubber Ponds. As a result, it was determined an alternative source exists for the exceedances of the GWPS at SSLs for lithium under the CCR Rule (§ 257.95(g)(3)(ii)).

1.3 Regulatory Framework

As noted above, the former Scrubber Ponds are currently in assessment monitoring in anticipation of closure through removal of CCR. Baseline groundwater monitoring was completed in 2017, as documented in the 2017 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area (Barr, 2018). A detection monitoring program began on October 17, 2017, and continued until April 14, 2018 (Barr, 2019a). SSIs over background levels were determined for certain constituents listed in appendix III to the CCR Rule (§ 257.95(a)) in 2018 (total dissolved solids (TDS), fluoride, boron, calcium, chloride, pH, and sulfate). In response to these SSIs, an assessment monitoring program was initiated on April 15, 2018. This program continued until 2023.

On January 2, 2019, it was determined that the initial assessment monitoring and resample events resulted in detections of lithium and selenium at statistically significant levels above applicable GWPS. An assessment of corrective measures (ACM) was initiated on April 2, 2019, and completed on August 29, 2019 (Barr, 2019b). An ASD ended the selection of remedy phase of remedial actions required by the CCR Rule on January 31, 2021 (Barr, 2021). The Site is currently in assessment monitoring.

1.4 Description of the Monitoring Well System

The groundwater monitoring system is a multi-unit groundwater monitoring system, as provided in § 257.91(d), meaning that both the former Scrubber Ponds and the former TSP (closed) are monitored by a single groundwater monitoring system. The monitoring well system around the CCR unit consists of three hydraulically upgradient wells (MW-103, MW-110, and MW-119) and four downgradient wells (MW-111, MW-117, MW-118, and MW-120) as shown on Figure 1.

The geological strata at the Site consists of fine- and coarse-grained unconsolidated alluvial sediments overlying bedrock (Ft. Union Formation). The upgradient wells are screened in primarily coarse-grained sediments. The downgradient monitoring wells are located hydraulically downgradient of the CCR unit along the waste boundary, are spaced approximately 500 feet (or less) apart and are screened in primarily fine-grained sediments. The number, spacing, and hydraulic positions of the monitoring wells comply with requirements outlined in § 257.91(a-c) of the CCR Rule.

1.5 Groundwater Standards

Once assessment monitoring is triggered for a CCR unit, § 257.95(d)(2) requires that GWPS be established for appendix IV constituents detected in groundwater. GWPS are defined as the higher of the Maximum Contaminant Level (MCL) or default GWPS, and the background concentration level for the detected constituent based on statistical methods established in § 257.93(f-g). Based on § 257.95(h)(2) and the July 30, 2018, Phase 1 CCR Rule revision, a final GWPS was established for the appendix IV constituents detected in groundwater.

The Phase 1 revision to the CCR Rule included a default lithium groundwater protection standard of 40 µg/L (0.04 mg/L). The laboratory analyzing Site groundwater samples lowered its lithium reporting limit from 0.1 mg/L to 0.04 mg/L starting in July 2018, and then subsequently to 0.02 mg/L. Previous lithium data from the Site, which were mostly below detection at higher reporting limits, were removed from the

baseline groundwater dataset, and additional data were collected. As a result of these changes, the lithium GWPS has been updated twice as additional upgradient samples have been collected and analyzed.

2 ASD Hypotheses

The hypotheses and corresponding determinations supporting the ASD are summarized below.

2.1 Hypothesis No. 1: Natural Variation

More naturally occurring lithium is present in the fine-grained sediments than in coarse-grained sediments. As a result, groundwater in zones of fine-grained sediments will typically have higher lithium concentrations than groundwater in zones of coarse-grained sediments. The upgradient wells at the Site are screened in primarily coarse-grained sediments and downgradient wells at the Site are screened in primarily fine-grained sediments. Therefore, due to the natural variability between sediments in which upgradient and downgradient wells are screened at the Site, it is possible that the observed downgradient lithium concentrations are due to natural variation in lithium content in the sediments.

2.1.1 Variation in Solids Concentration with Sediment Type within the Aquifer Matrix

To test hypothesis No. 1, a total of eight site sediment samples (see Table 2) from five different borings were sent to Pace Inter-Mountain Laboratories (Pace) in Sheridan, Wyoming. The sediment samples were crushed in a mill and analyzed for total lithium (Total Metals) using EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition*, methods 3050 and 6010. Logs for the five borings are presented in Appendix A.

Both samples from boring SB-3 were judged to be relatively well graded. As such, the samples were sieved using a no. 230 sieve. The fraction retained on the sieve is sand and gravel (coarse-grained sediments) and the fraction passing the sieve is silt and clay (fine-grained sediments). Both fractions were crushed and analyzed for lithium. The remaining samples were determined to be more homogenous and, therefore, did not require sieving.

Analytical results for the sediment samples are summarized in Table 2. The lithium concentrations for fine-grained sediments (clay and silt) ranged from 11.5 milligrams per kilogram (mg/kg) to 22.7 mg/kg, with an average concentration of 16.1 mg/kg. In the coarse-grained sediments (sand and gravel), the concentrations ranged from 4.0 mg/kg to 6.9 mg/kg, with an average concentration of 5.4 mg/kg. The results indicate that the average lithium concentration in the fine-grained sediments is more than three times the average lithium solids concentration in the coarse-grained sediments. The laboratory report for the analysis of the sediment samples is included in Appendix B.

Table 2 Lithium Solids Concentration by Sample Material Type

Texture	Sample ID	Sample Depth within Boring (ft)	Lithium Result (mg/kg)
Fine	SB-2	2 to 5	11.5
Fine	SB-3	3.5 to 10.5	13.6
Fine	SB-3	10.5 to 15	14.2
Fine	T-2	23.5 to 30	18.1
Fine	T-13	3.5 to 10	16.2
Fine	T-13	15 to 20	22.7
Fine Average			16.1
Fine Range			11.5 to 22.7
Coarse	SB-2	10 to 20	4.9
Coarse	SB-3	3.5 to 10.5	5.8
Coarse	SB-3	10.5 to 15	6.9
Coarse	T-1	19 to 23	4.0
Coarse Average			5.4
Coarse Range			4.0 to 6.9

2.1.2 Variation in Lithium Mobility with Sediment Type

The sediment analysis presented above confirmed that fine-grained sediments at the Site have more lithium within the solid matrix than coarse-grained sediments. Leach tests, which simulate what the lithium concentrations would be in groundwater, were done on sediment samples from areas at the Site that have not been affected by the CCR unit to estimate how much naturally occurring lithium could be mobilized from the solid matrix to groundwater.

Ten additional borings (T-14 through T-23) and associated temporary wells were installed across the Site, scattered upgradient and side gradient of the CCR unit to obtain samples for this evaluation. Borings T-14 through T-22 were located in areas that are not hydraulically downgradient from any of the current or former CCR units (Figure 2). It was subsequently determined that boring location T-23 may have been affected by historical (pre-CCR Rule) Site activities not associated with any CCR units so the analytical results for the sample from boring T-23 were not carried forward in the evaluation. Logs for these borings are presented in Appendix A.

Pace analyzed sediment samples from these borings by a saturated paste extract procedure (SPE Method; Pace SOP S-SATPASTE-1.1). Samples that had dried and hardened were crushed using a mortar and pestle; however, rock fragments larger than #10 mesh (2 mm) were removed from the samples for the SPE Method analyses.

Analytical results for samples classified as fine-grained or coarse-grained from borings T-14 through T-22 are summarized in Table 3. The laboratory report for the analyses is presented in Appendix B. The lithium concentrations leached from the fine-grained material in the liquid extract ranged from 0.02 to 0.14 mg/L,

with an average of 0.06 mg/L. The lithium concentrations leached from the coarse-grained material in the liquid extract ranged from 0.02 to 0.06 mg/L, with an average of 0.03 mg/L. These results indicate that in areas that could not have been influenced by the CCR units (existing and closed) the fine-grained sediments release more lithium to groundwater, and with greater variation, than coarse-grained sediments. The results also indicate that the average SPE leachate lithium concentration from fine-grained sediments was approximately twice the average leachate lithium concentration from the coarse-grained sediments.

Table 3 Summary Saturated Paste Extracts for Lithium

Sediment Type	Boring ID	Sample Depth within Boring (ft)	Sediment Type (field-estimated composition in boring logs)	Lithium Result (mg/L)
Fine	T-14	5-7	>95% fines	0.03
Fine	T-14	7-10	>90% fines	0.04
Fine	T-14	10-13	>90% fines	0.03
Fine	T-15	14.25-17.5	100% fines	0.04
Fine	T-16	11-13	100% fines	0.02
Fine	T-17	10.75-15	100% fines	0.07
Fine	T-18	12.5-14.5	100% fines	0.14
Fine	T-20	5.5-8.25	100% fines	0.02
Fine	T-21	13.75-15	100% fines	0.08
Fine	T-22	3.5-10	100% fines	0.03
Fine	T-22	10-15	100% fines	0.10
Fine	T-22	15-20	100% fines	0.10
Fine Average				0.06
Fine Range				0.02 to 0.14

Sediment Type	Boring ID	Sample Depth within Boring (ft)	Sediment Type (field-estimated composition in boring logs)	Lithium Result (mg/L)
Coarse	T-15	5-10	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.03
Coarse	T-15	10-14.25	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.02
Coarse	T-16	3-11	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.03
Coarse	T-17	5-10.75	Well graded sand with silt (5% gravel, 85% sand, 10% fines)	0.02
Coarse	T-18	5-10	Well graded sand with silt and gravel (15% gravel, 75% sand, 10% fines)	0.03
Coarse	T-18	10-12.5	Well graded sand with silt and gravel	0.02
Coarse	T-19	3.5-5	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.06
Coarse	T-19	5-10	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.02
Coarse	T-19	10-14.5	Poorly graded sand with silt and gravel (20% gravel, 70% sand, 10% fines)	0.02
Coarse	T-21	5-13.75	Poorly graded sand with silt and gravel (15% gravel, 70% sand, 15% fines)	0.05
Coarse Average				0.03
Coarse Range				0.02 to 0.06

Temporary wells were installed in borings T-14 through T-22 to facilitate collection of groundwater samples. The groundwater samples were analyzed for lithium at Minnesota Valley Testing Laboratories. As can be seen on Figure 2, the lithium concentrations detected in the samples from temporary wells T-20 and T-22, which were completed in fine-grained sediments, were 1.6 to 2.3 times the lithium concentrations in the samples collected from temporary wells completed in coarse-grained sediments. These analytical results for the groundwater samples corroborate the results of the leach testing. Field sampling forms and the laboratory report for the analyses of the groundwater samples are presented in Appendix B.

2.1.3 Statistical Upper Limit of Natural Variability

As shown above, fine-grained sediments at the Site have generally higher lithium content than coarse-grained sediments at the Site. As a result, higher lithium concentrations can be leached from fine-grained sediments than from coarse-grained sediments at that Site. The lithium GWPS (0.0631 mg/L) was established by calculating the parametric upper tolerance limit for background lithium concentrations measured in groundwater samples from the upgradient wells in the CCR monitoring network, consistent with the CCR Rule. Well logs (Appendix A) show that upgradient wells are screened in primarily coarse-grained soils while downgradient wells are screened in primarily fine-grained soils. Therefore, the effect of

the geologic variability at the Site on naturally occurring lithium concentrations in groundwater is not captured in the existing GWPS determination.

To understand an upper limit of lithium concentration in groundwater that might result from natural variability, the fine-grained sediment leaching data presented in Table 3 was used to calculate an upper prediction limit of 0.16 mg/L (Figure 3), which is more than 2.5 times the established GWPS. This upper limit of natural variability more accurately represents potential downgradient background concentrations.

2.1.4 Conclusions

The analytical data confirm that more naturally occurring lithium is present in fine-grained sediments than in coarse-grained sediments at the Site and that more lithium is mobilized to the liquid phase from the fine-grained sediments than from the coarse-grained sediments. As a result of the natural variation in lithium content, groundwater in zones of fine-grained sediments will contain more lithium than groundwater in zones of coarse-grained sediments. The average lithium concentration in SPE leachate, intended to simulate groundwater conditions, from fine-grained sediments is approximately twice the concentration in leachate from coarse-grained sediments.

The upgradient wells in the CCR monitoring network are screened in predominantly coarse-grained sediments whereas the downgradient wells are screened in predominantly fine-grained sediments (Figure 2).

Finally, statistical evaluation of lithium concentrations obtained from the analyses of SPE leachate from fine-grained sediments resulted in a statistical upper limit of natural variability that is more than 2.5 times the GWPS. Based on these geologic relationships, elevated concentrations of lithium in downgradient wells are to be expected due to the upper limit of natural variability for the Site, and exceedances of the GWPS in these wells are the result in part due to natural variation in groundwater quality. Lithium concentrations in all four downgradient wells are lower than the statistical upper limit of natural variability for lithium.

2.2 Hypothesis No. 2: Carbonaceous Zone

Naturally occurring carbonaceous zones within the aquifer matrix, which typically exhibit elevated lithium concentrations, are present in fine-grained sediments within or near the screened intervals of downgradient wells in the CCR monitoring network. As a result, it is possible that the GWPS based on upgradient wells is not representative of the background lithium concentrations in downgradient wells.

2.2.1 Lithium Concentrations within Carbonaceous Material

Carbonaceous materials are defined herein to include lignite or other types of coal, or other organic materials, that are inferred to contain visually significant amounts of carbon. To determine if the carbonaceous material could be contributing to the elevated downgradient groundwater concentrations, eight samples of carbonaceous material were extracted from available sediment cores (obtained from previous Site investigations) and subjected to the SPE leachate extraction analysis. Logs for the borings associated with these sediment cores are presented in Appendix A.

As shown in Table 4, SPE leachate analyses of carbonaceous samples for lithium identified concentrations ranging from 0.06 to 0.13 mg/L, with an average concentration of 0.09 mg/L. The average lithium concentration in the carbonaceous material SPE leachate, intended to simulate groundwater conditions, is 1.5 times the average concentration from fine-grained samples and three times the average concentration from coarse-grained samples, raising the potential upper range for lithium concentration due to natural variability when compared to fine-grained sediments without carbonaceous material. The laboratory report for the analyses of carbonaceous material samples is presented in Appendix B.

Table 4 Summary of SPEs for Lithium in Carbonaceous Materials

Boring ID	Sample Depth within Boring (ft)	Lithium Result (mg/L)
SB-2	20.5-21	0.11
T-2	22.5-23.5	0.07
T-3	30-32.5	0.13
T-5	10-15	0.09
T-6	19.5-20	0.08
T-17	10.75-15	0.10
T-18	12.5-14.5	0.09
T-22	10-15	0.06
average		0.09
range		0.06 to 0.13

2.2.2 Carbonaceous Material Location Compared to Downgradient Wells

Carbonaceous material was identified in the MW-111 boring log (Appendix A) at a depth of approximately 3 feet below the well screen. Common industry practice is to backfill any over-drilled depth below the well screen using filter pack sand. This backfill below the well screen would allow transfer of groundwater from the carbonaceous zone to the well screen during sampling, likely affecting water quality.

The boring logs for the remaining downgradient wells did not identify carbonaceous material, though the older Site wells provide little detail on the materials encountered during well construction. Since carbonaceous zones can be thin, these zones could be present in the downgradient wells even though they were not noted on the well logs. While downgradient CCR monitoring network wells MW-117, MW-118, and MW-120 do not document carbonaceous material at the well locations, additional borings surrounding these downgradient wells provided evidence of carbonaceous zones (Figure 2). Table 5 provides the maximum and most recent lithium concentrations measured in downgradient wells and the approximate distances from the downgradient wells to the nearest boring in which carbonaceous material was identified. Measured lithium concentrations tended to be higher in groundwater where a downgradient carbonaceous zone was identified closer to the well, with the highest lithium concentration correlating to well MW-111 where carbonaceous material was documented within the boring (Appendix B).

Table 5 Carbonaceous Zone Correlation to Downgradient Groundwater Concentrations

Downgradient CCR Well	Maximum Measured Lithium Concentration in Groundwater* (mg/L)	Spring 2023 Lithium Concentration in Groundwater (mg/L)	Distance to Closest Boring with Documented Carbonaceous Material (ft)
MW-111	0.227	0.158	within boring
MW-120	0.176	0.109	125
MW-117	0.155	0.107	160
MW-118	0.102	0.065	280

*Maximum lithium concentration measured in assessment monitoring groundwater samples.

By inference from the information presented above, the presence of carbonaceous materials within the well boring contributes to elevated concentrations of lithium in MW-111. The site investigation boring logs document that carbonaceous material is present at the distances shown in Table 5 from each downgradient well. Based on the information in Table 5, there appears to be a relationship between groundwater lithium concentrations and distance to the nearest documented location of carbonaceous material, although carbonaceous material may be closer to the wells than documented by the borings.

Since the average lithium concentration SPE leachate analyses is about 1.5 times the average for fine-grained materials, it would be anticipated that lithium in groundwater samples that are influenced by carbonaceous materials would be much higher. It is apparent that carbonaceous materials in the downgradient monitoring zone have a significant impact on lithium concentrations in these wells and the regulated CCR unit is not the cause of elevated concentrations.

2.2.3 Conclusion

The average lithium concentration in the carbonaceous material SPE leachate is greater than the average concentrations in leachate from fine-grained or coarse-grained sediment samples. The locations where carbonaceous material was identified in boring logs also appear to correlate with the elevated lithium concentrations in CCR monitoring network wells. For instance, monitoring well MW-111 has the highest lithium concentration for the spring 2023 event (0.158 mg/L) and is the only downgradient well with carbonaceous material documented in the well’s boring log. The detected lithium concentration appears to be within the range of natural variability when carbonaceous material is present. These data show that the presence of carbonaceous material in the aquifer matrix contributes to elevated lithium in downgradient groundwater.

3 Conclusion

The analysis summarized in this report supports a demonstration, consistent with requirements of § 257.95(g)(3)(ii) of the CCR Rule, that the presence of concentrations of lithium at statistically significant levels above the GWPS are attributable to sources other than the CCR unit. The following hypotheses were proven to support this determination:

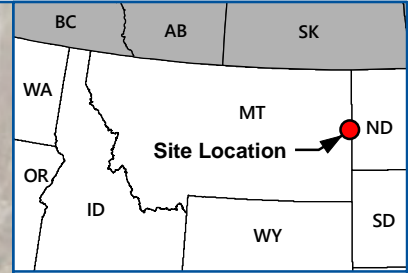
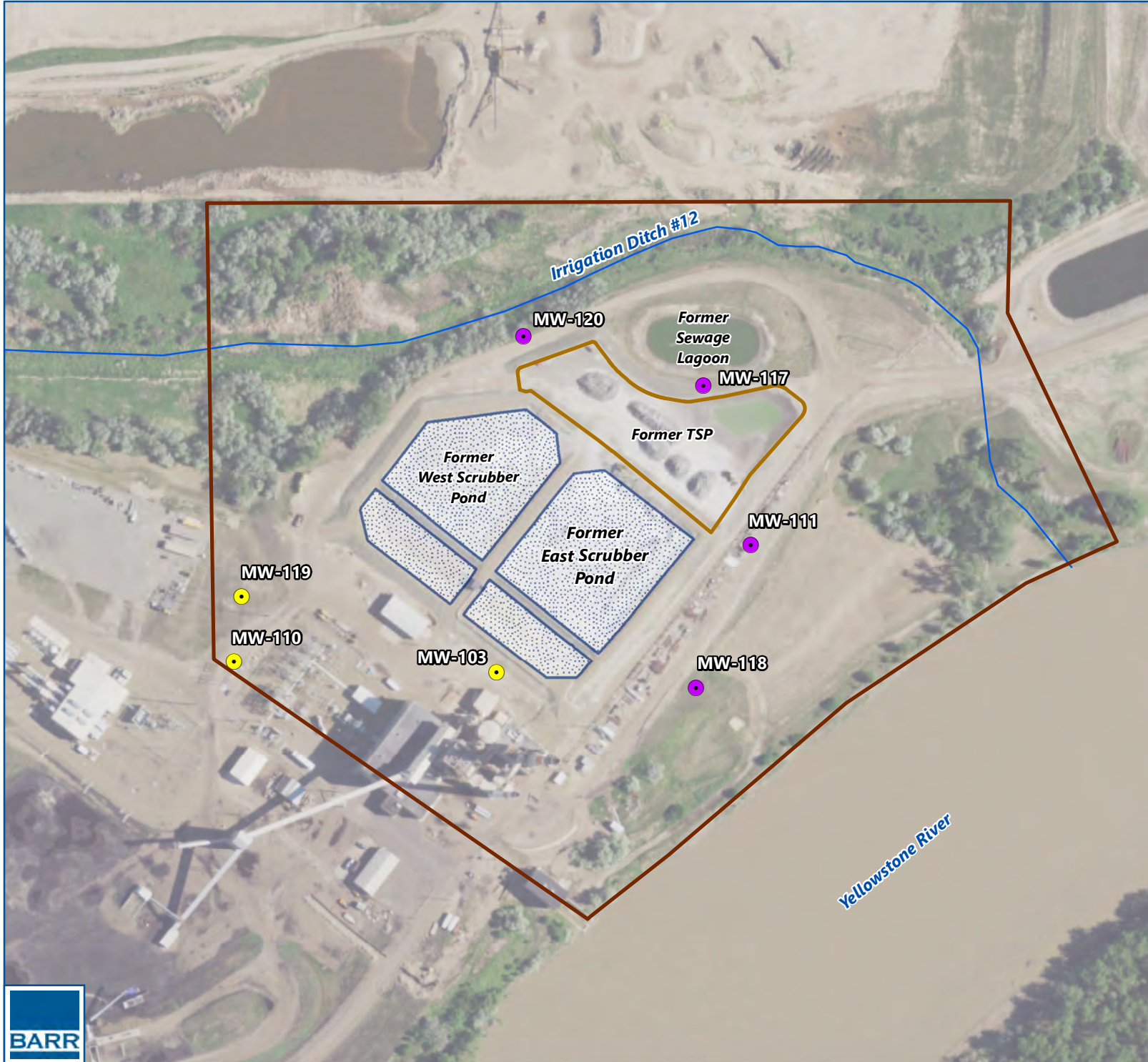
- **Hypothesis No. 1:** Due to the natural variability between sediments in which upgradient and downgradient wells are screened, the observed downgradient concentrations are due in part to the natural variation in lithium content of the sediments.
- **Hypothesis No. 2:** The GWPS based on upgradient wells is not representative of the background lithium concentrations in downgradient wells due to naturally occurring carbonaceous zones within the aquifer matrix present in fine-grained sediments within or near the screened intervals of the downgradient wells.






Taken together, the lines of evidence presented above provide adequate documentation and support that an alternative source is responsible for the presence of lithium at statistically significant concentrations above the GWPS. Therefore, it is concluded that the combined effects of natural variability and presence of carbonaceous material in the area downgradient from the CCR unit establish an alternative source, and there does not appear to be a release from the former Scrubber Ponds.

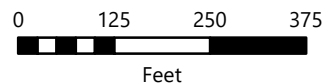
4 References

- Barr Engineering Co., 2016. Evaluation of Existing Surface Impoundment Liner, West and East Scrubber Ponds. Prepared for Montana-Dakota Utilities, September 2016.
- Barr Engineering Co., 2018. 2017 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area. Prepared for Montana Dakota Utilities, January 2018.
- Barr Engineering Co., 2019a. 2018 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area, Lewis & Clark Station. Prepared for Montana Dakota Utilities, January 2019.
- Barr Engineering Co., 2019b. Assessment of Corrective Measures, Lewis & Clark Station. Prepared for Montana-Dakota Utilities, August 2019.
- Barr Engineering Co., 2020a. Alternative Source Demonstration, Temporary Storage Pad, Lewis & Clark Station. Prepared for Montana Dakota Utilities, November 2020.
- Barr Engineering Co., 2020b. 2019 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area, Lewis & Clark Station. Prepared for Montana Dakota Utilities, January 2020.
- Barr Engineering Co., 2021. 2020 Annual Groundwater Monitoring and Corrective Action Report, Scrubber Pond and Temporary Storage Area, Lewis & Clark Station. Prepared for Montana Dakota Utilities, January 2021.

Figures



-  Upgradient Monitoring Well
-  Downgradient Monitoring Well
-  Former Scrubber Ponds
-  Former Temporary Storage Pad (TSP)
-  Site Boundary

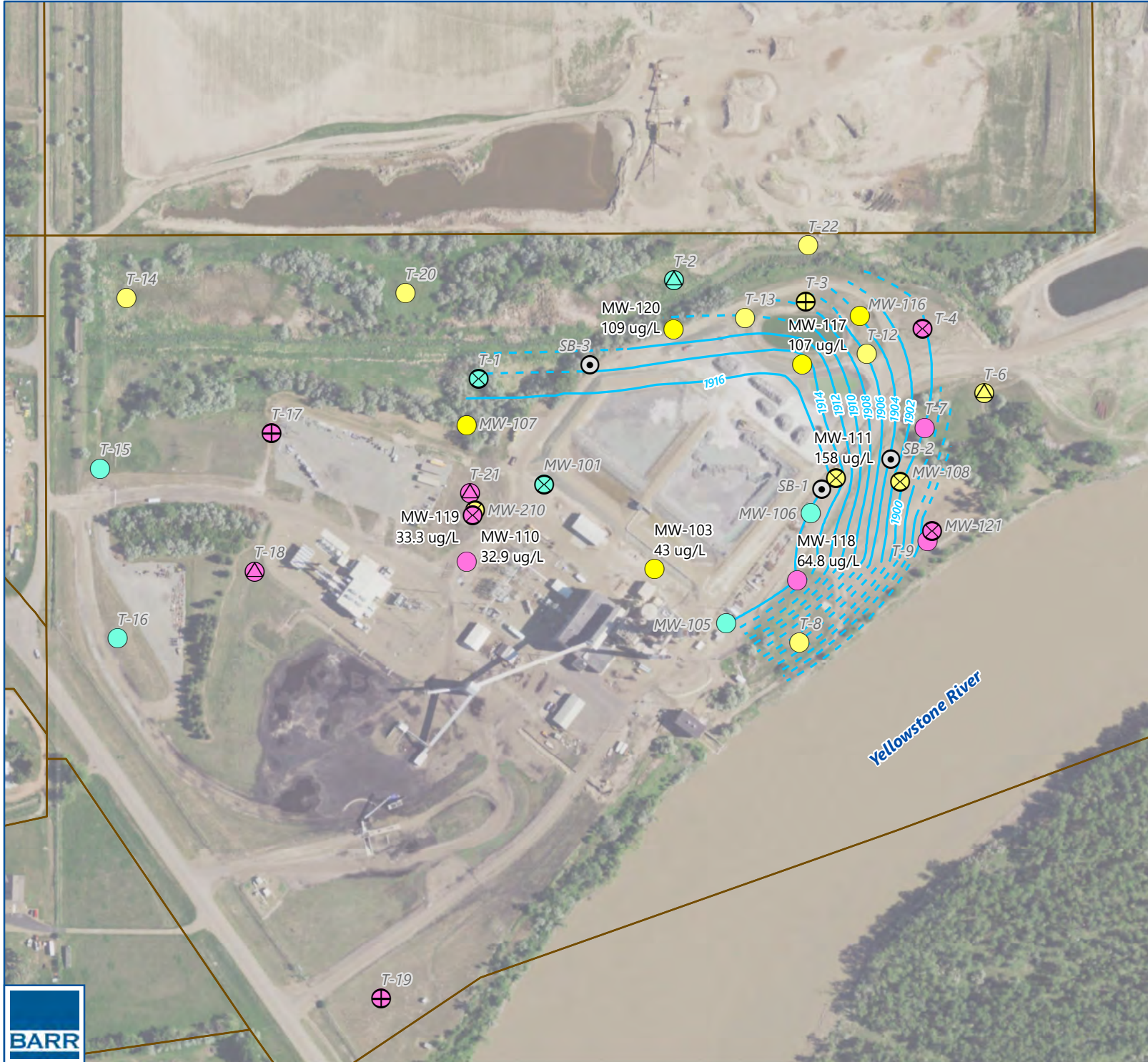


Imagery: 2021 NAIP, USDA-FSA

SITE LAYOUT
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT

FIGURE 1





- Soil Boring Location
 - Groundwater Contour (dashed where inferred)
 - Parcel Boundary
- Material Type within Well Screen**
- Coarse Material
 - Fine Material
 - Mixed Material
- Carbonaceous Material Presence**
- Above Well Screen
 - In Well Screen
 - Below Well Screen

Note:
Material type and carbonaceous material presence were determined from boring logs (Appendix A). Lithium concentrations previously measured in samples collected from temporary wells (T-1 through T-13 in January 2019 and T-14 through T-23 in April 2020) are documented in Appendix B.

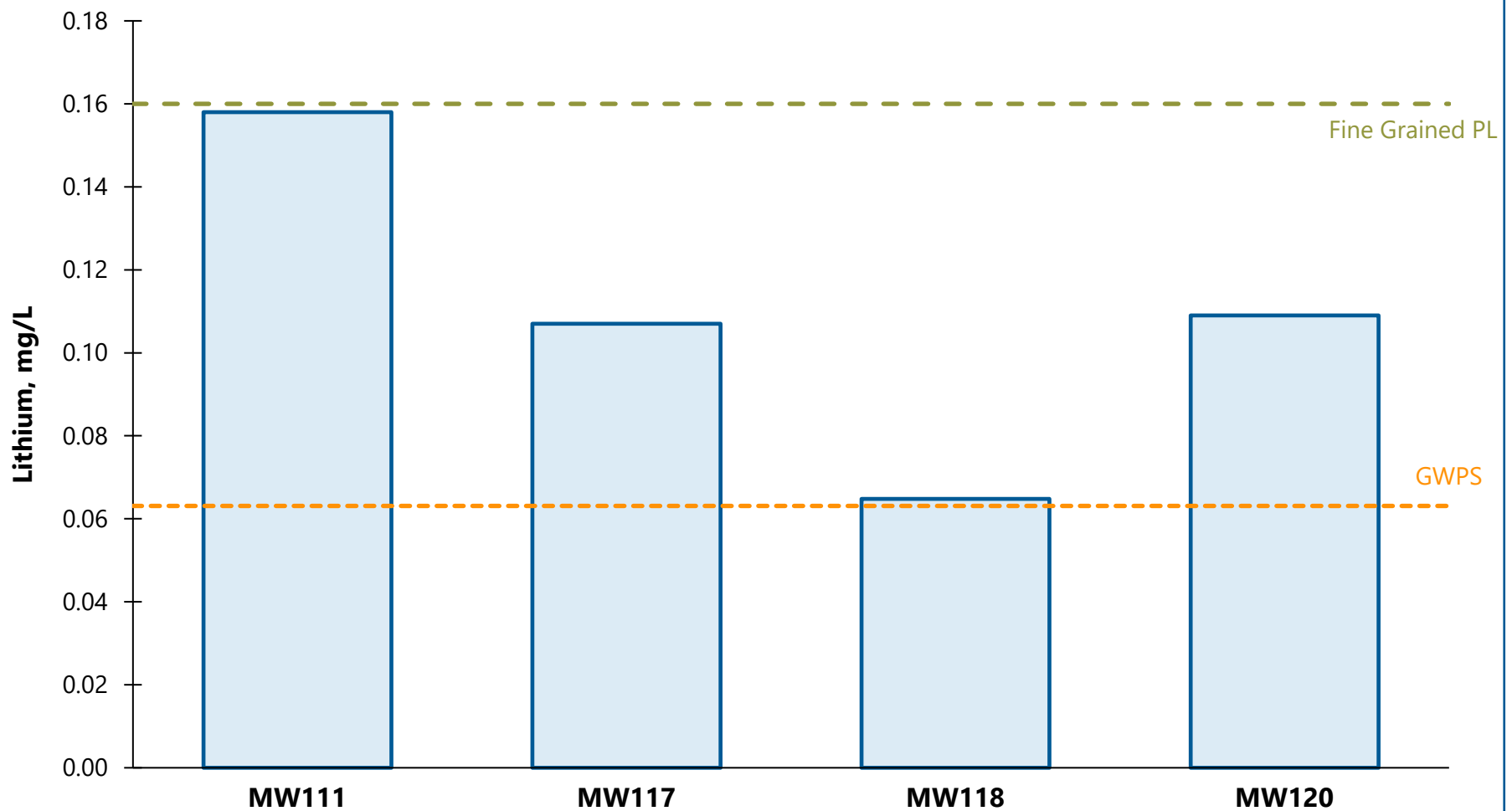
0 175 350 525
Feet

Imagery: 2021 NAIP, USDA-FSA

**WELL MATERIAL TYPES AND
LITHIUM CONCENTRATIONS
SPRING 2023**
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT

FIGURE 2





Fine-Grained PL: Prediction Limit calculated from 12 fine-grained sediment leach samples (Table 3); 0.16 mg/L

GWPS: Groundwater Protection Standard; 0.0631 mg/L

Groundwater lithium concentrations from samples collected in April 2023

LITHIUM UPPER LIMIT OF
NATURAL VARIABILITY
Lewis & Clark Station
Montana-Dakota Utilities Co.
Richland County, MT

FIGURE 3

Appendices

Appendix A
Site Boring Logs

LOG OF BORING



PROJECT: W86-007 SOIL BORINGS Fly Ash Sludge Lagoons MDU Lewis & Clark Station Sidney, MT	BORING: ST-103W LOCATION: Middle of SW side of lagoons, see N.C.C. drawing
DATE: 1/21/86	SCALE: 1"=4'

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
23.2						
22.7	.5		GRAVEL surfacing			gp
19.7	3½	CL	SILTY CLAY, low to medium plasticity, dark brown to grayish brown, moist, very stiff (fine alluvium)	21		4+
16.7	6½	CL	SANDY CLAY, low plasticity, brown, moist, rather stiff (fine alluvium)	10		2
		GW-GM	SANDY GRAVEL, fine to medium grained, a little silt, wet to waterbearing, loose to dense (coarse alluvium)	17		
				5		
				57		
08.2	15					
06.2	17	ML	SANDY SILT, nonplastic, light gray, moist, very dense (siltstone)	52		1 3/4
		CH	FAT CLAY, high plasticity, light gray, moist, hard (claystone)			
02.7	20½			38		4+
			Water level down 10.1' with 19' of hollow-stem auger in the ground			
			Water level down 9.3' immediately after withdrawal of auger			
			2" PVC monitoring well installed to a depth of 19', see sketch			

State law requires that the Bureau's copy be filed by the water well driller within 60 days after completion of the well.

1. WELL OWNER
Name MDU Lewis & Clark Sta

2. CURRENT MAILING ADDRESS
400 North 4th
Bismarck, ND 58501

3. WELL LOCATION
SE 1/4 NW 1/4 SW 1/4 Section 9
Township 22 Range 59 County Richland
Gov't Lot _____, or Lot _____, Block _____
Subdivision Name _____
Tract Number _____

4. PROPOSED USE: Domestic Stock Irrigation
Other specify Monitoring

5. TYPE OF WORK: Hollowstem Auger x
New well Method: Dug Bored
Deepened Cable Driven
Reconditioned Rotary Jetted

6. DIMENSIONS: Diameter of Hole
Dia. 8 in. from 0 ft. to 18 ft.
Dia. _____ in. from _____ ft. to _____ ft.
Dia. _____ in. from _____ ft. to _____ ft.

7. CONSTRUCTION DETAILS:
Casing; Steel Dia. _____ from _____ ft. to _____ ft.
Threaded Welded Dia. _____ from _____ ft. to _____ ft.
Type _____ Wall Thickness _____
Casing; Plastic Dia. 2 from +1.8 ft. to 8 ft.
Weight SDR-21 Dia. _____ from _____ ft. to _____ ft.
PERFORATIONS: Yes No
Type of perforator used _____
Size of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

SCREENS: Yes No
Manufacturer's Name Timco PVC
Type _____ Model No. _____
Dia. 2 Slot size #10 from 8 ft. to 15 ft.
Dia. _____ Slot size _____ from _____ ft. to _____ ft.

GRAVEL PACKED: Yes No Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

ROUTED: To what depth? 7 ft.
Material used in grouting 263# bentonite chips

8. WELL HEAD COMPLETION:
Pitless Adapter Yes No

9. PUMP (if installed)
Manufacturer's name _____
Type _____ Model No. _____ HP. _____

10. WELL TEST DATA
The information requested in this section is required for all wells. All depth measurements shall be from the top of the well casing.
All wells under 100 gpm must be tested for a minimum of one hour and provide the following information:
a) Air _____ Pump _____ Bailer _____
b) Static water level immediately before testing _____ ft. If flowing; closed-in pressure _____ psi. _____ gpm.
Flow controlled by: _____ valve, _____ reducers, _____ other, (specify) _____
c) Depth at which pump is set for test _____
d) The pumping rate: _____ gpm.
e) Pumping water level _____ ft. at _____ hrs. after pumping began.

f) Duration of test: Pumping time _____ hrs.
g) Recovery time _____ hrs.
h) Recovery water level _____ ft. at _____ hrs. after pumping stopped.

Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form.

NOTE: All wells shall be equipped with an access port 1/2 inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.

11. WAS WELL PLUGGED OR ABANDONED? Yes No
If yes, how? _____

12. WELL LOG #3, 110.
Depth (ft.) From To Formation

0	0.3	Silt, sandy w/gravel, dark brown
0.3	1	Silt, sandy w/gravel, reddish brown
1	4	Silt, sandy w/gravel & cobbles, medium brown
4	14	Gravel, to coarse, w/cobbles, abt 30% sand, med. brown
14	18	Silt, light blue, Bedrock

ATTACH ADDITIONAL SHEETS IF NECESSARY

13. DATE COMPLETED 8/28/91

14. DRILLER/CONTRACTOR'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.
Date 1 Dec 91
Firm Name Water Supply Inc
Address 2501 Twin City Dr
Mandan, ND 58504
Signature [Signature] License No. 296/004

Project: Lewis and Clark Station
 Project No.: 26411007.00 PH1-014
 Location: Sidney, Montana
 Coordinates: UTM 13N N:2248510.70m, E:3584876.38m
 Datum: NAVD88

Surface Elevation: 1917.5 ft
 Drilling Method: Hollow Stem Auger
 Sampling Method: Split Spoon
 Completion Depth: 19.0 ft

Top of Casing Elev.: 1920.3 ft
 Unique Well No.:

Depth, feet	Sample Type & Recovery	Sample No.	SCSU	Graphic Log	LITHOLOGIC DESCRIPTION	MAJOR UNIT	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0			CL		TOPSOIL - SANDY CLAY (CL): fine grained; brown; frozen.	Fill	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3'	1917.5
2.5			CL/ML		FILL - SILTY CLAY (CL/ML): yellow; moist; medium to high plasticity; strong HCl reaction; 0% gravel, 5% sand, 95% fines, orange staining.			1915.0
5.0			CL/ML		SILTY CLAY TO CLAY (CL/ML): light yellow brown - to olive yellow; moist to wet; low to medium plasticity; 0% gravel, 0% sand, 100% fines, hard to very hard, black oxidation spots, trace orange oxidation, rusty oxidation on fracture boundaries, very fine grain sand.	Alluvium	RISER CASING Diameter: 2" Type: Sch 40 PVC Interval:	1912.5
7.5			CL/ML					GROUT Type: Concrete Interval: 0-1' bgs
10.0			CL		CLAY (CL): gray; dry to moist; high plasticity; strong HCl reaction; 0% gravel, 0% sand, 100% fines, very hard, Fort Union Formation, black oxidation spots, rusty oxidation on fracture boundaries, occurrence of silty clay, low to high plasticity.	Fort Union	SEAL Type: Bentonite chips Interval: 1-4.5' bgs	1907.5
12.5			CL		13': Dry, no oxidation, non-plastic.		SANDPACK Type: 20/40 Interval: 4.5-10' bgs	1905.0
15.0			CL				SCREEN Diameter: 2" Type: No. 10 Sch 40 Interval: PVC 5-10' bgs	1902.5
17.5								1900.0
19.0					End of well 19.0 feet			

Date Boring Started: 2/20/16
 Date Boring Completed: 2/21/16
 Logged By: DJZ
 Drilling Contractor: Terracon
 Drill Rig: CME-55

Remarks:

Additional data may have been collected in the field which is not included on this log.
 Weather: 25°F, overcast

O:\GINT\PROJECTS\26411007 MIDU LEWIS AND CLARK STATION\26411007.GPJ BARR\LIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Project: Lewis and Clark Station
 Project No.: 26411007.00 PH1-014
 Location: Sidney, Montana
 Coordinates: UTM 13N N:2247960.01m, E:3584863.71m
 Datum: NAVD88

Surface Elevation: 1921.1 ft
 Drilling Method: Hollow Stem Auger
 Sampling Method: Split Spoon
 Completion Depth: 12.0 ft

Top of Casing Elev.: 1924.1 ft
 Unique Well No.:

Depth, feet	Sample Type & Recovery	Sample No.	SCSU	Graphic Log	LITHOLOGIC DESCRIPTION	MAJOR UNIT	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0			CL		TOPSOIL - SANDY CLAY (CL): dark olive gray; frozen.	Fill		
2.5			SW		SAND WITH GRAVEL (SW): very dark grayish brown; dry to wet; 25% gravel, 75% sand, 0% fines, fine-to-medium-grained subangular sand; subangular gravel with some cobbles, well graded.	Alluvium	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3' RISER CASING Diameter: 2" Type: Sch 40 PVC Interval:	1920.0
5.0							GROUT Type: Concrete Interval: 0-1' bgs	1917.5
7.5					8: Medium/coarse grained, subangular sand with small to large subangular cobbles and gravels.		SEAL Type: Bentonite chips Interval: 1-5' bgs	1915.0
10.0			ML		Rusty brown water at contact. SILT (ML): very pale brown; moist; low plasticity; some brown layers within.	Fort Union	SANDPACK Type: 20/40 Interval: 5-12' bgs	1912.5
12.5			CL		CLAY (CL): gray; moist; very hard, homogenous, Fort Union Formation, non-plastic. End of well 12.0 feet		SCREEN Diameter: 2" Type: No. 10 Sch 40 Interval: PVC 6-11' bgs	1910.0

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Date Boring Started: 2/21/16
 Date Boring Completed: 2/22/16
 Logged By: DJZ
 Drilling Contractor: Terracon
 Drill Rig: CME-55

Remarks:

Additional data may have been collected in the field which is not included on this log.
 Weather: 20°F, fog

Project: Lewis and Clark Station
 Project No.: 26411007.00 PH1-014
 Location: Sidney, Montana
 Coordinates: UTM 13N N:2248125.79m, E:3584035.03m
 Datum: NAVD88

Surface Elevation: 1923.3 ft
 Drilling Method: Hollow Stem Auger
 Sampling Method: Split Spoon
 Completion Depth: 16.0 ft

Top of Casing Elev.: 1926.3 ft
 Unique Well No.:

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Depth, feet	Sample Type & Recovery	Sample No.	SCSC	Graphic Log	LITHOLOGIC DESCRIPTION	MAJOR UNIT	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0					TOPSOIL - SANDY CLAY MIX: black; dry; less than 1".			
2.5			GW		FILL - GRAVEL WITH SAND (GW): pinkish gray; dry to wet; 50% gravel, 50% sand, 0% fines, well graded, large to small subrounded gravel and cobbles, fine to coarse grained subangular sand, no HCL reaction.	Fill	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3' RISER CASING Diameter: 2" Type: Sch 40 PCV Interval:	1922.5 1920.0
5.0			SW		SAND WITH GRAVEL (SW): pinkish gray; moist to wet; 40% gravel, 55% sand, 5% fines, well graded fine to coarse grained sand, large to small subrounded gravel and cobbles.	Alluvium	GROUT Type: Neat Cement Interval: 3-5' bgs SEAL Type: Bentonite chips Interval: 5-7' bgs SANDPACK Type: 20/40 Interval: 7-16' bgs SCREEN Diameter: 2" Type: No. 10 Sch 40 Interval: PVC 9-14' bgs	1917.5 1915.0 1912.5
7.5					7': Some orange/black oxidation in sand.			
10.0					10': Some heaving sand.			
15.0			ML		SILT (ML): gray; moist; 0% gravel, 0% sand, 100% fines, very hard, non-plastic, low HCL reaction.	Fort Union		
15.75					15.75: Lignite lense.			
16.0					End of well 16.0 feet			1907.5

Date Boring Started: 2/18/16
 Date Boring Completed: 2/18/16
 Logged By: DJZ
 Drilling Contractor: Terracon
 Drill Rig: CME-55

Remarks:

Additional data may have been collected in the field which is not included on this log.
 Weather: 35°F, overcast

Project: Lewis and Clark Station	Surface Elevation: 1919.0 ft	Top of Casing Elev.: 1922.0 ft
Project No.: 26411007.00 PH1-014	Drilling Method: Hollow Stem Auger	
Location: Sidney, Montana	Sampling Method: Split Spoon	
Coordinates: UTM 13N N:m, E:m	Completion Depth: 16.0 ft	
Datum: NAVD88		

O:\GINT\PROJECTS\26411007 MDU LEWIS AND CLARK STATION\26411007.GPJ BARR\LIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

Depth, feet	Sample Type & Recovery	Sample No.	Blows/6in.	ENVIRONMENTAL DATA	U C S S	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0							CLAY FILL (CL-CH): yellowish brown (10YR 5/4); frozen; hard; roots.		
2.5			7-9-14-18.	G/S/F:0%/ 0%/ 100% G/S/F:15%/ 60%/ 25%			SAND W/ GRAVEL (SP-SC): brown (10YR 4/3); moist; very fine grained sand, subround gravels, large to small.	PRO. CASING Diameter: 6" Type: Steel Interval: Surface + 3'	1917.5
5.0			8-12-13-10.	G/S/F:5%/ 70%/ 25% G/S/F:0%/ 5%/ 95%			CLAY (CL-CH): light yellowish brown (2.5Y /4); moist to wet; hard; crumbly, areas of CLAYSTONE within.	RISER CASING Diameter: 2" Type: Sch 40 PCV Interval:	1915.0
7.5			5-6-7-11.	G/S/F:15%/ 15%/ 80%			At 5': 4" FAT CLAY (CH), brown (10YR 4/3), hard Increasing sand and gravels within claystone. Mostly fine grained sand, smal gravels, subround. At 6-7.5': Mix of fat clay and claystone w/ sand/gravel within w/ little silt pockets.	GROUT Type: Cement Interval: 0-1.5' bgs	1912.5
10.0			2-4-3-0.	G/S/F:5%/ 20%/ 75%			At 7.5': Transitions to SANDY CLAY (CL/CH), high plasticity with very fine to coarse grained sand within, subround to subangular. Trace gravels, small to large. Rusty red oxidation spots and fractures. Few black manganese oxidation spots. Few white precipitate veins/spots.	SEAL Type: Bentonite chips Interval: 1.5-9' bgs	1910.0
12.5			1-2-3-0.	G/S/F:10%/ 20%/ 70%	CL-CH		At 11': Color change to dark grayish brown (10YR 4/2), softer. At 12': Sample, wet.	SANDPACK Type: 10/20 Interval: 9-16' bgs	1907.5
15.0			1-3-3-0.	G/S/F:10%/ 20%/ 70%				SCREEN Diameter: 2" Type: No. 12 Sch 40 PVC Interval: 11-16' bgs	1905.0
17.5			1-2-3-4.	G/S/F:0%/ 0%/ 100%	CL-ML		SILTY CLAY/CLAYEY SILT (CL-ML): light gray/gray; wet; soft; with trace black roots and rusty orange oxidations stains.		
20.0							End of well 16.0 feet		

Date Boring Started: 1/29/18
 Date Boring Completed: 1/29/18
 Logged By: DJZ
 Drilling Contractor: SK Geotechnical
 Drill Rig:

Remarks: After 15 min., water level was at 12.9 ft bgs. After 40 min., water level was at 12.6 ft bgs.

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
 Additional data may have been collected in the field which is not included on this log.

Project: Lewis and Clark Station	Surface Elevation: 1902.4 ft	Top of Casing Elev.: 1904.6 ft
Project No.: 26411007.14 Boundary Well	Drilling Method: Hollow Stem Auger	
Location: Sidney, Montana	Sampling Method:	
Coordinates: UTM 13N N:17326179m, E:1848702m	Completion Depth: 14.0 ft	
Datum:		

Depth, feet	Sample Type & Recovery	Sample No.	Blows/6in.	ENVIRONMENTAL DATA	S C S U	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0.0		1	W-2-3-3.	G/S/F:0%/ 5%/ 95%	CL		CLAY (CL): dark grayish brown (10YR 4/2); moist to wet; roots; thin fine grained sand laminations.	<p>-6" steel protop: +3 to 2 ft bgs -concrete: 0 to 2 ft bgs -bentonite seal: 2 to 6 ft bgs -2" PVC schedule 40 riser: +2.5 to 8 ft bgs -10/20 silica sand filter pack: 6 to 13 ft bgs -2" #10 schedule 40 PVC screen: 8 to 13 ft bgs</p>	1900.0
2.5		2	1-1-4-6.	G/S/F:0%/ 60%/ 40%	SM		SILTY SAND (SM): olive brown (2.5Y 4/3); moist to wet; roots; fine grained sand within; few sandy lenses.		1900.0
5.0		3	2-2-3-3.	G/S/F:0%/ 90%/ 10%	SP		SAND (SP): fine grained sand; trace fines, loose; light olive brown (2.5Y 5/3); moist.		1897.5
7.5		4	1-3-3-.	G/S/F:0%/ 90%/ 10%			At 5.75 ft, 2 in lens silty clay, mottled w/ rusty orange oxidation spots. At 5.95 ft and 6.25 ft, 2 in silt lens w/ fine grained sand and mottled w/ rusty orange oxidation spots.		1895.0
		5	1-5-4-.	G/S/F:0%/ 95%/ 5%			At 8 ft, trace fine grained orange terracotta fragments.		
		6	W-3-5-3.	G/S/F:0%/ 90%/ 10%			At 9 ft, saturated.		
10.0		7	2-2-3-.	G/S/F:0%/ 90%/ 10% G/S/F:90%/ 10%/ 0%	GP		GRAVEL (GP): fine to coarse grained; subrounded; trace fine to coarse grained sand.		1892.5
12.5		8	1-1-1-.	G/S/F:0%/ 0%/ 100%	CL-CH		CLAY [FORT UNION FORMATION] (CL-CH): very dark gray; wet; soft; high plasticity.		1890.0
15.0							End of boring 14.0 feet		

Date Boring Started: 9/26/19 2:45 pm
 Date Boring Completed: 9/26/19 4:00 pm
 Logged By: DJZ
 Drilling Contractor: S&K Geotechnical
 Drill Rig:

Remarks: Dashed line indicates an inferred contact depth.
 Water level measured at time of drilling.

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
 Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING SB-2

DRAFT
 SHEET 1 OF 1

Project: GeoProbe Investigation Surface Elevation: 1914.4 ft
 Project No.: 26411007.10 Drilling Method: GeoProbe Direct-Push
 Location: Lewis & Clark Station, Sidney, MT Sampling Method: GeoProbe
 Coordinates: N 2,248,187.2 ft E 3,585,135.6 ft Completion Depth: 25.0 ft
 Datum: NAVD88

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			CL		CLAY (CL): dark brown; frozen; with roots; 0% gravel, 0% sand, 100% fines.	
5			CL		SILTY CLAY (CL): dark yellowish brown; moist; with roots, trace fine grained sand lenses within; weak HCl reaction; 0% gravel, 1% sand, 99% fines.	1910
10			SP		SAND (SP): fine grained; light gray/tan; moist to wet; subrounded; few areas with silty sand mix within; 0% gravel, 90% sand, 10% fines.	1905
15			SP			1900
20			CL-CH		CLAY (CL-CH): Fort Union Formation; gray; moist; lean to fat; high plasticity; 0% gravel, 5% sand, 95% fines, red oxidation staining on veins/fractures.	1895
					LIGNITE COAL: black; dry.	
			CL-CH		CLAY (CL-CH): gray & tan; moist; hard; lean to fat; 0% gravel, 5% sand, 95% fines, red oxidation staining on veins/fractures, with few mottles, with black organics within.	
25					End of boring 25.0 feet	1890

Date Boring Started: 1/31/19 9:55 am
 Date Boring Completed: 1/31/19 10:15 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: Log is duplicate of MW-108
 Cave: 24.45' bgs before abandoning borehole
 Weather: 15°F, overcast, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING SB-3

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1925.2 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,493.0 ft E 3,584,337.9 ft	Completion Depth:	20.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					FILL: push through road, no recovery.	1925
			CL		FILL - CLAY (CL): dark grayish brown; moist; with trace fine-medium grained sand mix within; high plasticity; 0% gravel, 5% sand, 95% fines.	
5			SC		CLAYEY SAND (SC): mostly fine grained with trace medium and coarse grained; subrounded; with few subrounded gravels; 10% gravel, 55% sand, 35% fines.	1920
10			SP		9.5' SAND (SP): 3-inch lens of fine grained; tan; moist to wet.	1915
			CL		SANDY CLAY (CL): dark gray; moist to wet; with fine to coarse sand and few gravels within, trace roots.	
15			SM		SILTY SAND (SM): fine grained with few medium and coarse grained; grayish brown; saturated; with trace to few small subrounded gravels within; 10% gravel, 60% sand, 30% fines.	1910
			ML		SANDY SILT (ML): very fine to fine grained; light olive brown; wet to saturated; mottled.	
20			CL-CH		LEAN TO FAT CLAY (CL-CH): olive yellow; moist; with golden brown mottles, trace manganese oxidation stains; medium plasticity.	
					End of boring 20.0 feet	

Date Boring Started: 1/31/19 2:05 pm
 Date Boring Completed: 1/31/19 2:25 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 10.20' bgs, not allowed to equilibrate
 Weather: 25°F, clear/sunny, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-1

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1914.6 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,474.2 ft E 3,584,051.4 ft	Completion Depth:	25.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						
0 - 3.5			SC		CLAYEY SAND (SC): fine grained few medium and coarse grained; subrounded; very dark grayish brown; frozen; with few small subrounded gravels; 10% gravel, 50% sand, 40% fines.	
3.5 - 4.5			CL		SILTY CLAY (CL): dark grayish brown; moist; 0% gravel, 0% sand, 100% fines.	1910
4.5 - 8.5			CL-CH		CLAY (CL-CH): dark grayish brown; moist; mottled with orange/red and gray; high plasticity; 0% gravel, 0% sand, 100% fines.	
8.5 - 9.0					8.5': color change to gray and dark gray.	
9.0 - 13.0					9.0': wet, fragments of black organics and lignite coal within.	1905
13.0 - 15.0					13': color change to grayish brown with mottles.	
15.0 - 20.0			CL		CLAY WITH SAND (CL): fine to medium grained; grayish brown; subrounded to subangular; wet to moist; 0% gravel, 25% sand, 75% fines.	1900
20.0 - 24.0			SW		SAND (SW): fine to coarse grained; wet; subrounded to subangular; well graded with gravels at contact.	1895
24.0 - 25.0			CL-CH		CLAY (CL-CH): Fort Union Formation; gray; moist; silt laminations as fractures within.	1890
25.0					End of boring 25.0 feet	

Date Boring Started: 1/31/19 3:10 pm
 Date Boring Completed: 1/31/19 4:20 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 0.99' bgs
 Weather: 25°F, partly cloudy, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-2

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1911.9 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,725.2 ft E 3,584,548.7 ft	Completion Depth:	30.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			OL		CLAY WITH ORGANICS (OL): dark grayish brown; frozen; roots; medium plasticity; 0% gravel, 0% sand, 100% fines.	1910
5			CL		LEAN CLAY (CL): gray; moist to wet; soft; rusty/oxidized mottles; high plasticity; 0% gravel, 1% sand, 99% fines. 8': Darker gray with black organics, soft.	1905
10			CL-CH		CLAY (CL-CH): gray; moist to wet; soft; mottled with rusty golden spots; high plasticity; 0% gravel, 0% sand, 100% fines.	1900
15			SM		SILTY SAND (SM): very fine to fine grained; grayish brown; trace medium to coarse grained sand; 0% gravel, 60% sand, 40% fines.	1895
18			CL-CH		CLAY (CL-CH): grayish brown; moist to wet; trace medium grained sand, mottled with gray spots; high plasticity.	
20			SM		SILTY SAND (SM): very fine to fine grained; grayish brown; trace medium to coarse grained sand; 0% gravel, 60% sand, 40% fines.	
22			SW		WELL GRADED SAND (SW): fine to coarse grained; subrounded to subangular; small to large gravels, subrounded to subangular.	1890
24			CL-CH		CLAY (CL-CH): olive brown; wet; soft; fragments of wood/roots within.	
25			CH		LIGNITE: black; wet; horizontal layering. CLAY (CH): Fort Union Formation; gray to dark gray; moist; hard.	
28			CL-CH		CLAY (CL-CH): gray; moist; hard; 0% gravel, 5% sand, 95% fines, breaks on fine grained sand veins, horizontal and paper thin, possible silt laminations with fine sand.	1885
30					End of boring 30.0 feet	

Date Boring Started: 2/1/19 8:40 am
 Date Boring Completed: 2/1/19 12:30 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: Artesian conditions once rods removed, no temp well installed, borehole sealed with bentonite chips, pipes were used to verify that no bridging occurred.
 Weather: 25°F, partly cloudy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-3

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1915.0 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,671.5 ft E 3,584,884.7 ft	Completion Depth:	32.5 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					LEAN CLAY (CL): brown; frozen to moist; lenses of silt, roots, few mottles; high plasticity; weak HCl reaction; 0% gravel, 0% sand, 100% fines.	
5			CL			1910
			ML		SILT (ML): brown; moist to wet; soft; 0% gravel, 0% sand, 100% fines.	
			CL		SILTY CLAY (CL): brown; moist to wet; few gray mottles and thin gray silt laminations, trace orange medium to coarse grained sand; 0% gravel, 1% sand, 99% fines.	
10			CH		FAT CLAY (CH): pale brown; moist; frequent gray mottles; high plasticity; 0% gravel, 0% sand, 100% fines.	1905
15			ML		SANDY SILT (ML): very fine grained; light olive brown; wet; soft; no HCl reaction; 0% gravel, 35% sand, 65% fines.	1900
20			SM		SILTY SAND (SM): very fine to fine grained; light olive brown; wet to saturated; very soft; trace gravels; 2% gravel, 60% sand, 38% fines.	1895
25			SP		SAND (SP): fine grained with trace medium to coarse grained; brown; wet; subrounded; trace small subrounded gravels.	1890
			CL		CLAY TO SILTY CLAY (CL): light olive brown; moist; hard; gray mottles, black organic lenses with fragments of lignite and roots; medium plasticity; 0% gravel, 5% sand, 95% fines.	
30			CH		FAT CLAY (CH): Fort Union Formation; gray; moist; hard; black organics and fragments of lignite; lignite at bottom of sample, 32.5'.	1885
					End of boring 32.5 feet	

Date Boring Started: 1/1/19 10:40 am
 Date Boring Completed: 2/1/19 3:00 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 11.93' bgs, temp well removed prior to advancing past 20'.
 Weather: -5°F, clear/sunny, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-5

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1912.8 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,649.6 ft E 3,585,434.0 ft	Completion Depth:	20.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	SSCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						1912.8
0 - 5			CL		FILL - CLAY (CL): grayish brown; frozen to moist; varying amounts of sand and gravels, fine to coarse grained, subrounded; weak HCl reaction; 15% gravel, 15% sand, 70% fines.	1910
5 - 10			ML		SILT (ML): brown; moist to wet; soft; fine grained silty sand lenses, areas of gray and rusty mottles; weak HCl reaction; 0% gravel, 10% sand, 90% fines.	1905
10 - 11			SP		SAND (SP): fine grained; brown; wet.	
11 - 15			ML-CL		SILTY CLAY & CLAYEY SILT (ML-CL): brown; wet; areas of gray and rusty mottles; weak HCl reaction.	1900
15 - 18			ML		SILT (ML): dark grayish brown; wet; soft; 0% gravel, 0% sand, 100% fines.	1895
18 - 20			CH		FAT CLAY (CH): Fort Union Formation; gray; wet; soft; high plasticity; 0% gravel, 0% sand, 100% fines.	
20					End of boring 20.0 feet	

Date Boring Started:	1/30/19 1:10 pm	Remarks:	WL: 14.36' bgs
Date Boring Completed:	1/30/19 1:35 pm	Weather:	5°F, clear/sunny, windy
Logged By:	DJZ	Additional data may have been collected in the field which is not included on this log.	
Drilling Contractor:	AET		
Drill Rig:	6620 DT		



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LOG OF BORING T-6

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1916.8 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,437.8 ft E 3,585,340.5 ft	Completion Depth:	20.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					LEAN CLAY (CL): brown; frozen to moist; few subrounded gravels and few subrounded to subangular sands; 10% gravel, 5% sand, 85% fines.	1915
5			CL		SILTY CLAY (CL): brown; moist; trace subrounded gravels, few fine grained clayey sand lenses, loose; 5% gravel, 20% sand, 75% fines.	1910
10			ML		SILT (ML): brown; wet; areas of clay/clayey silt within; 0% gravel, 0% sand, 100% fines.	1905
15			SP		SAND (SP): fine grained; tan; wet; loose; 0% gravel, 90% sand, 10% fines.	
			SM		CLAYEY SAND (SM): fine grained; brown; wet; loose to soft; 0% gravel, 65% sand, 35% fines.	
			CH		FAT CLAY (CH): Fort Union Formation; light olive brown to dark yellow; wet; hard; 2% gravel, 0% sand, 98% fines, trace gravel or mudstone at 18'.	1900
20			CH		CARBONACEOUS CLAY (CH): black; moist; hard; lignite within.	
					End of boring 20.0 feet	

Date Boring Started: 1/30/19 2:20 pm
 Date Boring Completed: 1/30/19 2:40 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 17.52' bgs
 Weather: 5°F, cloudy, windy
 Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-13

DRAFT
 SHEET 1 OF 1

Project:	GeoProbe Investigation	Surface Elevation:	1916.9 ft
Project No.:	26411007.10	Drilling Method:	GeoProbe Direct-Push
Location:	Lewis & Clark Station, Sidney, MT	Sampling Method:	GeoProbe
Coordinates:	N 2,248,629.2 ft E 3,584,730.4 ft	Completion Depth:	22.5 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	S U C S U	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					CLAY (CL-CH): brown; frozen; few fine to coarse sand and gravel, subrounded; 10% gravel, 10% sand, 80% fines.	1915
			CL-CH			
			GP		GRAVELLY LENS (GP).	
5			ML-CL		SILT WITH CLAY (ML-CL): light yellowish brown; wet; interbedded silt and clay lenses with rusty mottles.	1910
10			ML-CL		SILTY CLAY (ML-CL): light yellowish brown to light gray; moist to wet; hard; mottles, trace coal; 0% gravel, 0% sand, 100% fines.	1905
15			CL-CH		LEAN TO FAT CLAY (CL-CH): Fort Union Formation; gray; moist to wet; frequent fine silt laminations.	1900
20			CL-CH		17.5'-22.5': water bearing silt lenses throughout.	1895
					End of boring 22.5 feet	

Date Boring Started: 1/30/19 9:15 am
 Date Boring Completed: 1/30/19 10:15 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig: 6620 DT

Remarks: WL: 8.77' bgs
 Weather: -5°F, clear/sunny, windy
 Additional data may have been collected in the field which is not included on this log.

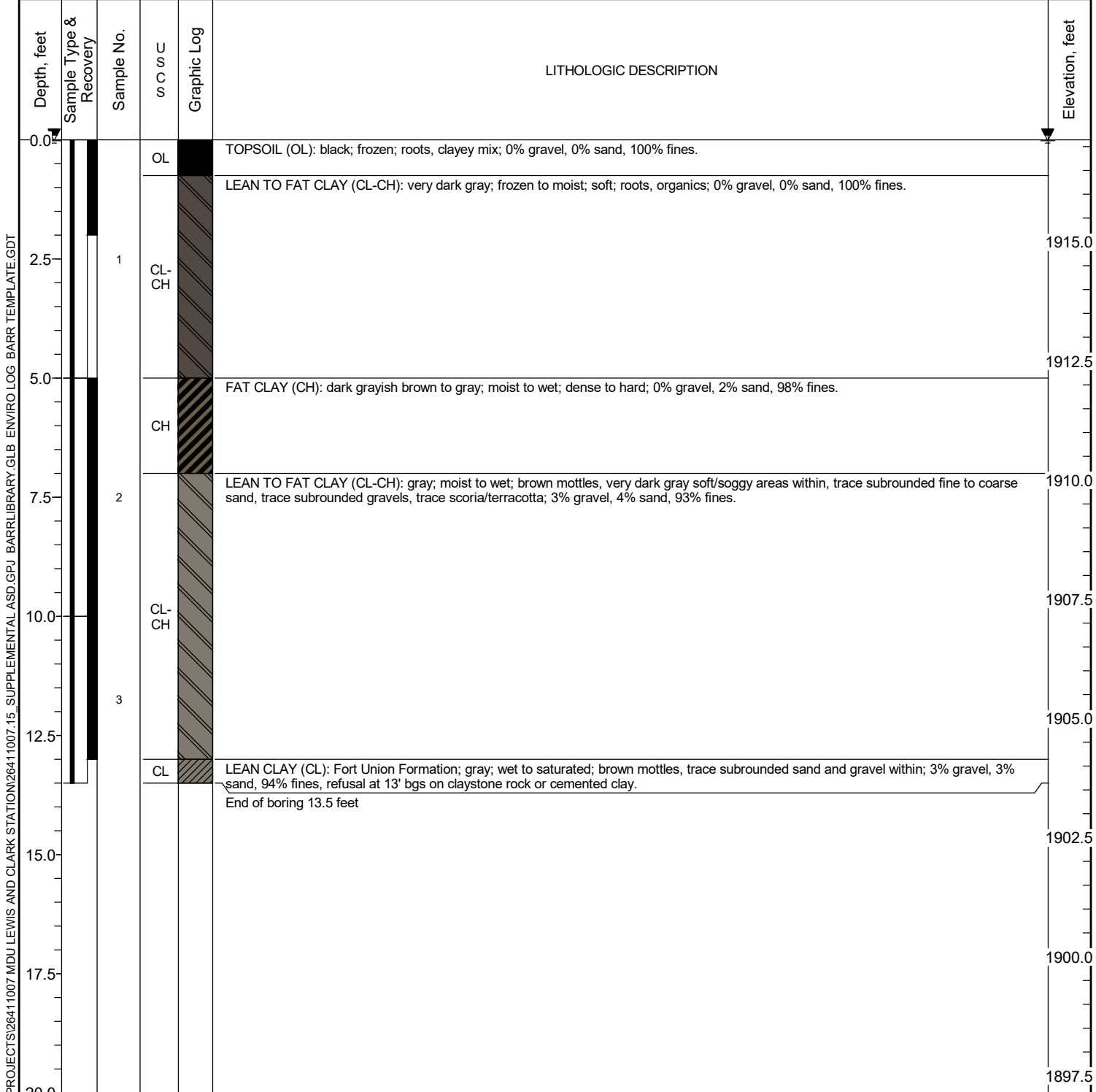


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LOG OF BORING T-14

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1917.1 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,679.6 ft E 3,583,153.0 ft	Completion Depth:	13.5 ft
Datum:	NAVD88		



Date Boring Started: 4/7/20 8:35 am
 Date Boring Completed: 4/7/20 9:05 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Refusal at 13.5' bgs - dense.
 Driller commented that 2-5' bgs was very soft (no push) - no recovery
 Temp well screen 3.5-13.5' bgs.
 Water at surface visible in bore hole/well.

Additional data may have been collected in the field which is not included on this log.

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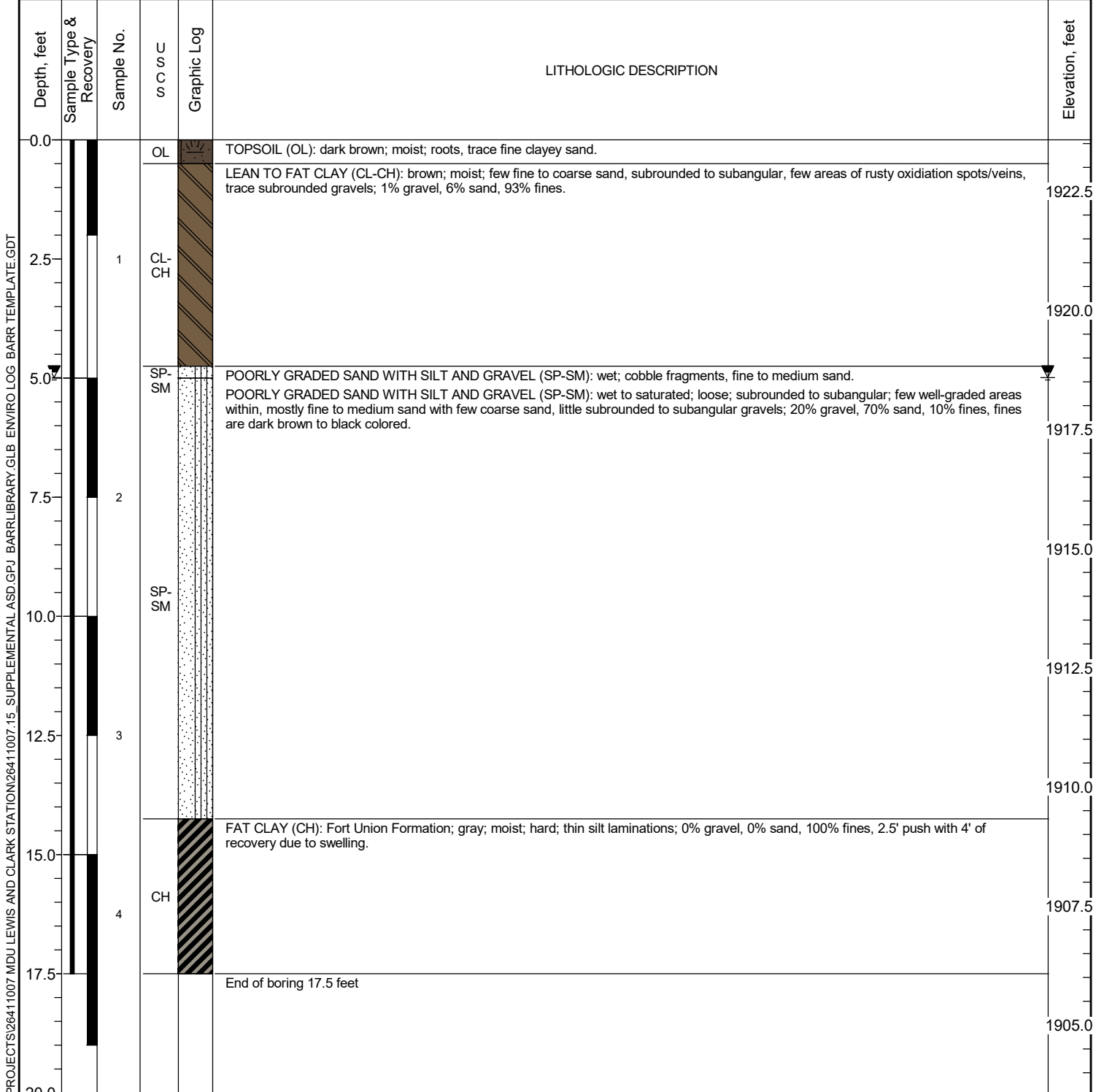


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LOG OF BORING T-15

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1923.6 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,244.4 ft E 3,583,085.3 ft	Completion Depth:	17.5 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 9:50 am
 Date Boring Completed: 4/6/20 10:30 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 1.5-11.5' bgs.
 Sand collapsed on screen.

Additional data may have been collected in the field which is not included on this log.

\\EDI-CAD\CAD\GINT\PROJECTS\26411007\MDU LEWIS AND CLARK STATION\26411007.15_SUPPLEMENTAL ASD.GPJ_BARR\LIBRARY\GLB ENVIRO LOG_BARR TEMPLATE.GDT



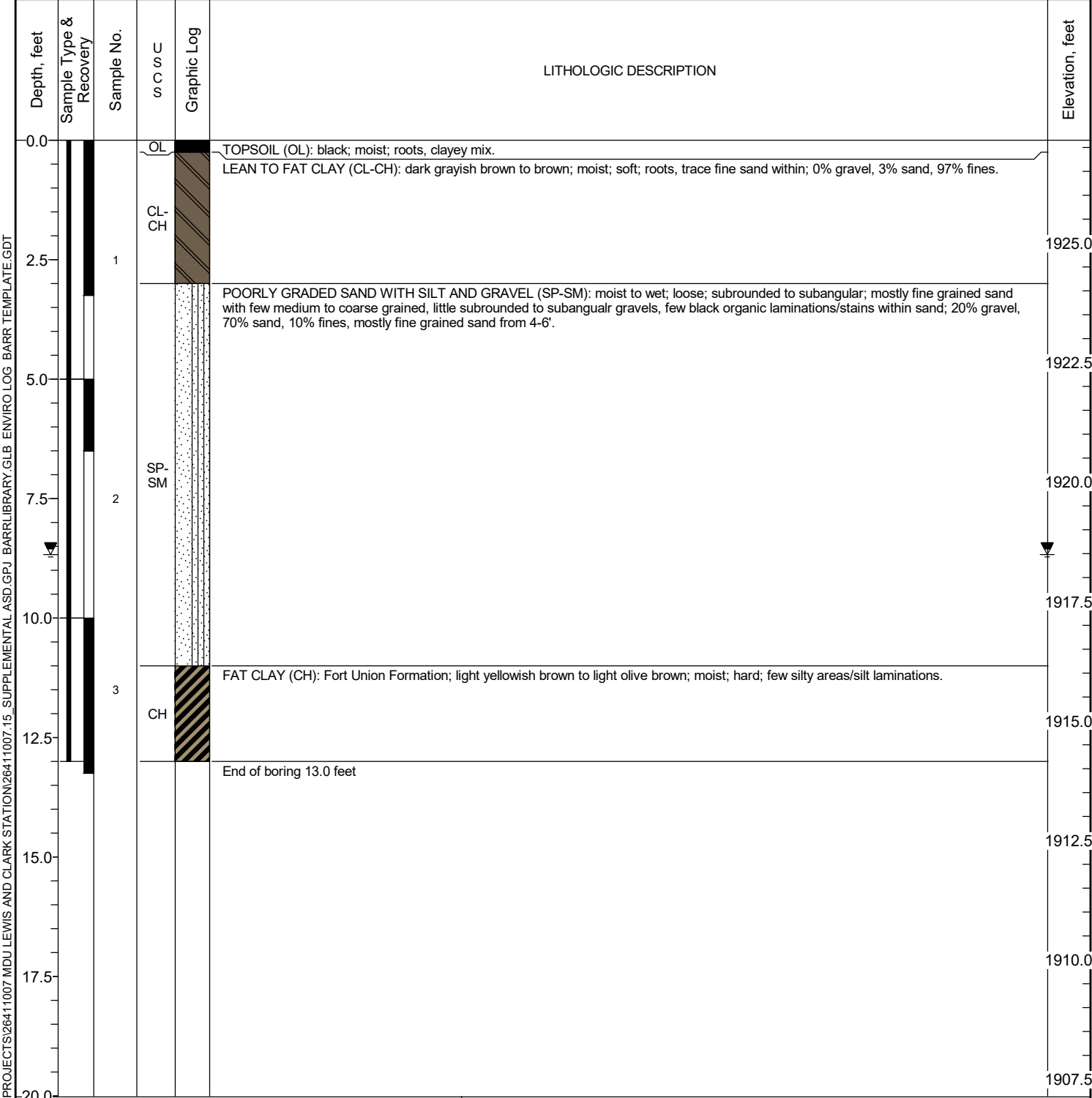
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 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING T-16

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD
 Project No.: 26411007.15
 Location: Lewis and Clark Station, Sidney, MT
 Coordinates: N 2,247,812.4 ft E 3,583,130.0 ft
 Datum: NAVD88

Surface Elevation: 1927.2 ft
 Drilling Method: Geoprobe Direct-Push
 Sampling Method: Geoprobe
 Completion Depth: 13.0 ft



Date Boring Started: 4/6/20 11:20 am
 Date Boring Completed: 4/6/20 12:10 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Refusal at 13' bgs, attempted second boring from offset location. Both pushes refused at 13' bgs.
 Temp well screen 8-13' bgs, expendable point used.
 Sand collapsed on screen.

Additional data may have been collected in the field which is not included on this log.

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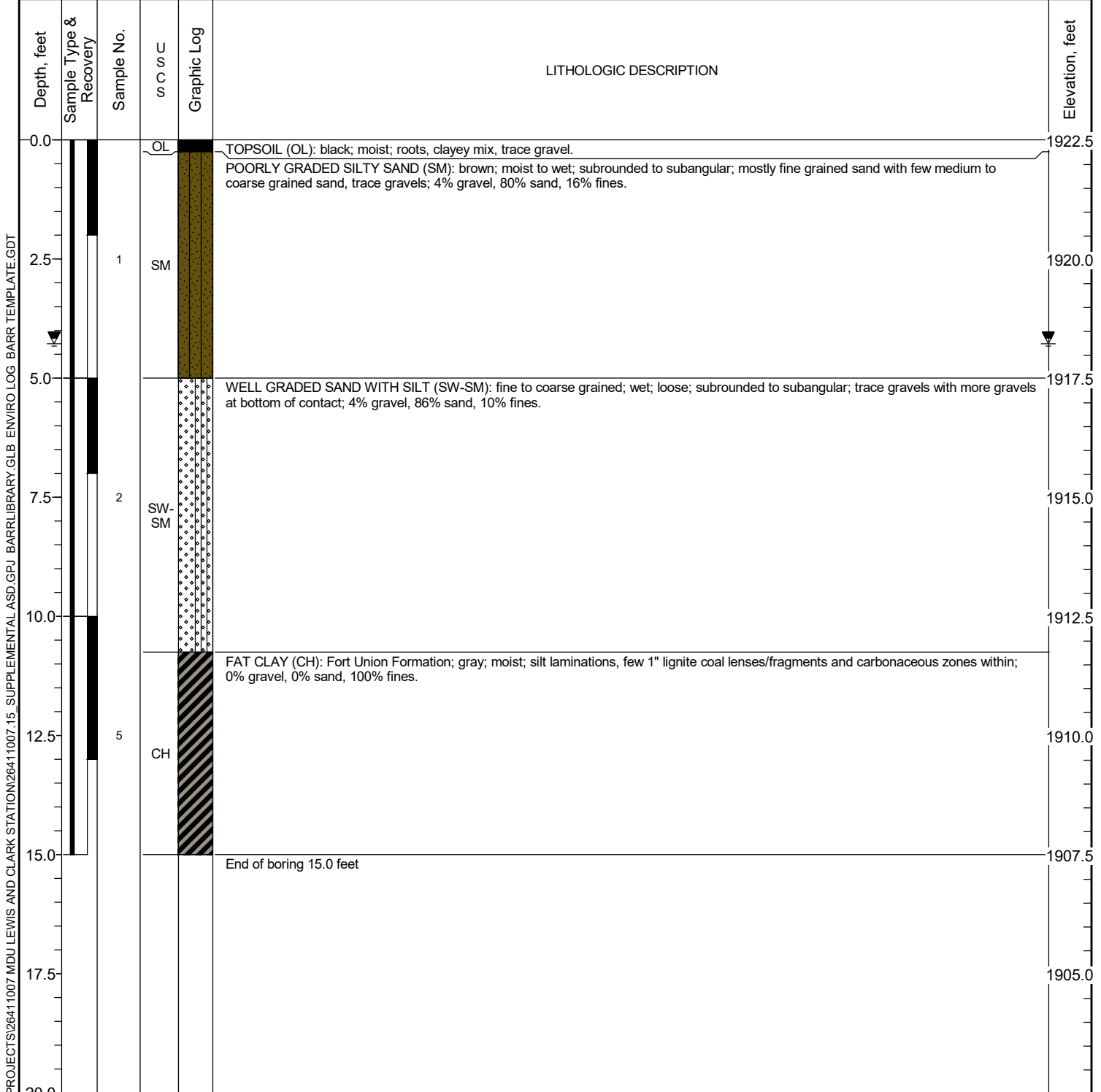


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LOG OF BORING T-17

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1922.5 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,336.3 ft E 3,583,522.5 ft	Completion Depth:	15.0 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 2:50 pm
 Date Boring Completed: 4/6/20 3:30 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 5-10' bgs, expendable point used. Sand collapsed on screen.

 Additional data may have been collected in the field which is not included on this log.

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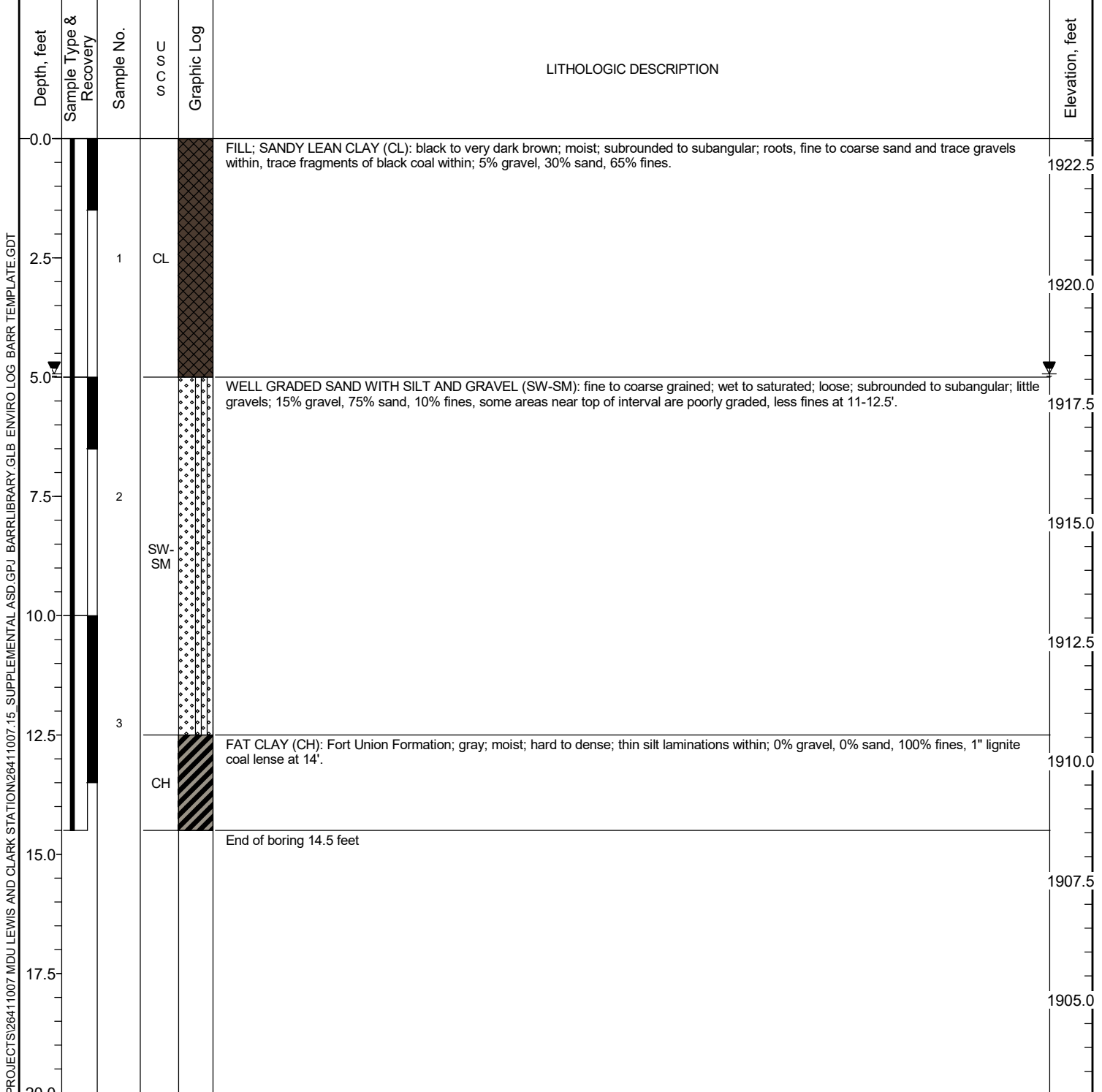


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LOG OF BORING T-18

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1923.1 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,247,982.1 ft E 3,583,479.1 ft	Completion Depth:	14.5 ft
Datum:	NAVD88		



Date Boring Started: 4/6/20 1:10 pm
 Date Boring Completed: 4/6/20 1:55 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: No recovery & refusal at 10-14.5' bgs, attempted second boring from offset location which hit refusal at 14.5' bgs.
 Temp well screen 3.5-13.5' bgs, expendable point used.
 Sand collapsed on screen.

Additional data may have been collected in the field which is not included on this log.

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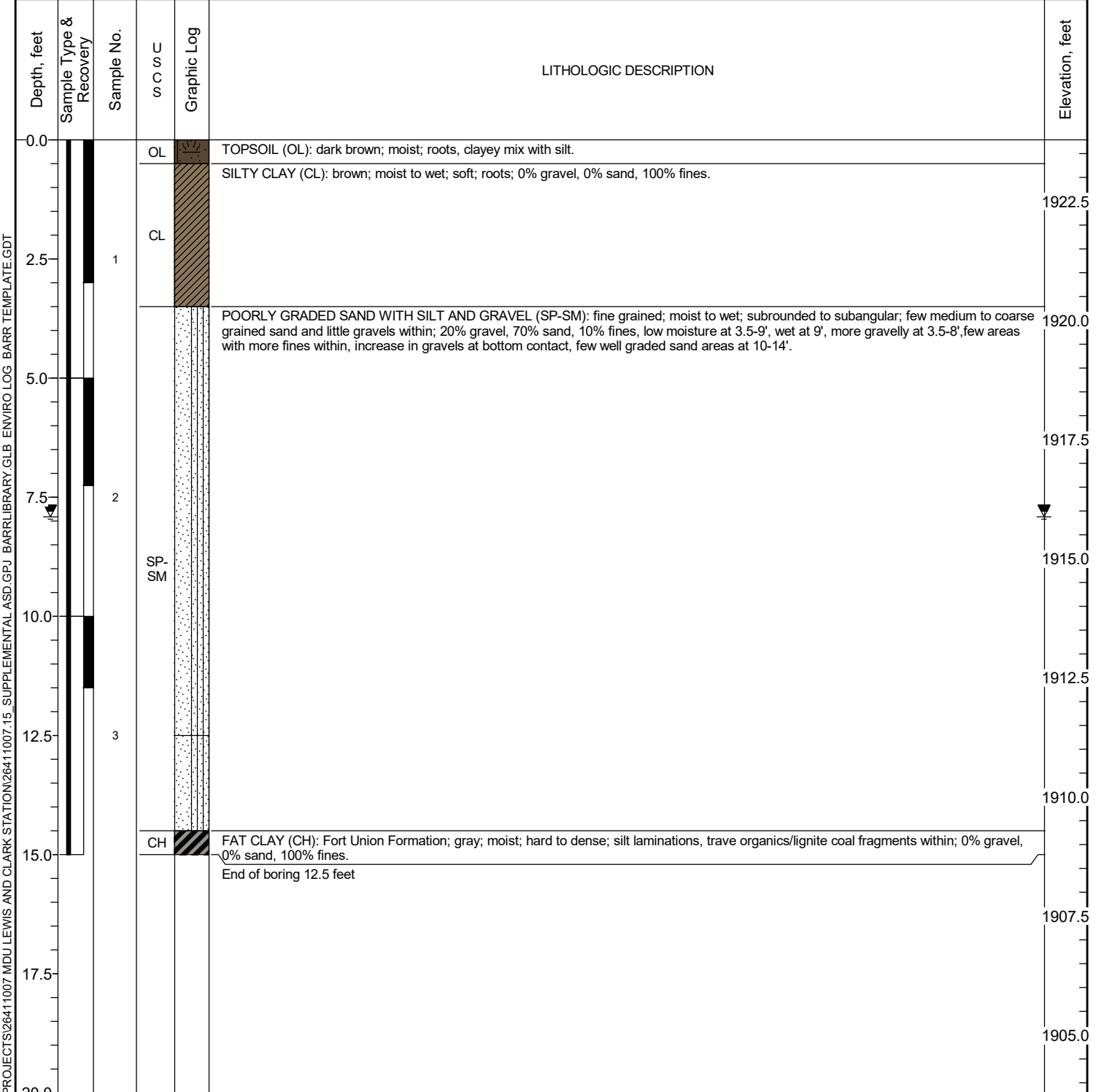
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 Bismarck, ND 58503
 Telephone: 701-255-5460

LOG OF BORING T-19

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD
 Project No.: 26411007.15
 Location: Lewis and Clark Station, Sidney, MT
 Coordinates: N 2,246,894.0 ft E 3,583,802.3 ft
 Datum: NAVD88

Surface Elevation: 1923.8 ft
 Drilling Method: Geoprobe Direct-Push
 Sampling Method: Geoprobe
 Completion Depth: 12.5 ft



Date Boring Started: 4/6/20 5:20 pm
 Date Boring Completed: 4/6/20 6:00 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: No recovery 5-10' bgs, completed second boring from offset location.
 Temp well screen 9-14' bgs, expendable point used.
 Sand collapsed on screen.

Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING T-20

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD
 Project No.: 26411007.15
 Location: Lewis and Clark Station, Sidney, MT
 Coordinates: N 2,248,692.1 ft E 3,583,864.1 ft
 Datum: NAVD88

Surface Elevation: 1920.7 ft
 Drilling Method: Geoprobe Direct-Push
 Sampling Method: Geoprobe
 Completion Depth: 15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	U S C S	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0.0			OL		TOPSOIL (OL): dark grayish brown; moist; roots, clayey mix.	1920.0
2.5		1	CL		SANDY LEAN CLAY (CL): fine to coarse grained; brown; moist; subrounded to subangular; trace gravels within; 5% gravel, 20% sand, 75% fines.	1917.5
5.0			CL-SC		POORLY GRADED SAND AND CLAY (CL-SC): fine grained; brown; moist; subrounded to subangular; few medium to coarse grained sand, few gravels; 10% gravel, 45% sand, 45% fines.	1915.0
7.5		2	CH		FAT CLAY (CH): light yellowish brown; moist; hard to dense; occasional brown and gray mottles, few black organic lenses/stains; 0% gravel, 0% sand, 100% fines.	1912.5
10.0		3	ML		SANDY SILT (ML): light olive yellow; wet to saturated; very fine grained sand within; 0% gravel, 40% sand, 60% fines, near liquid limit, sand and silt ratio varies with depth.	1910.0
12.5		4				1907.5
15.0					End of boring 15.0 feet	1905.0
17.5						1902.5
20.0						

Date Boring Started: 4/7/20 10:00 am
 Date Boring Completed: 4/7/20 10:30 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Refusal at 15' bgs.
 Temp well screen 5-15' bgs.

Additional data may have been collected in the field which is not included on this log.

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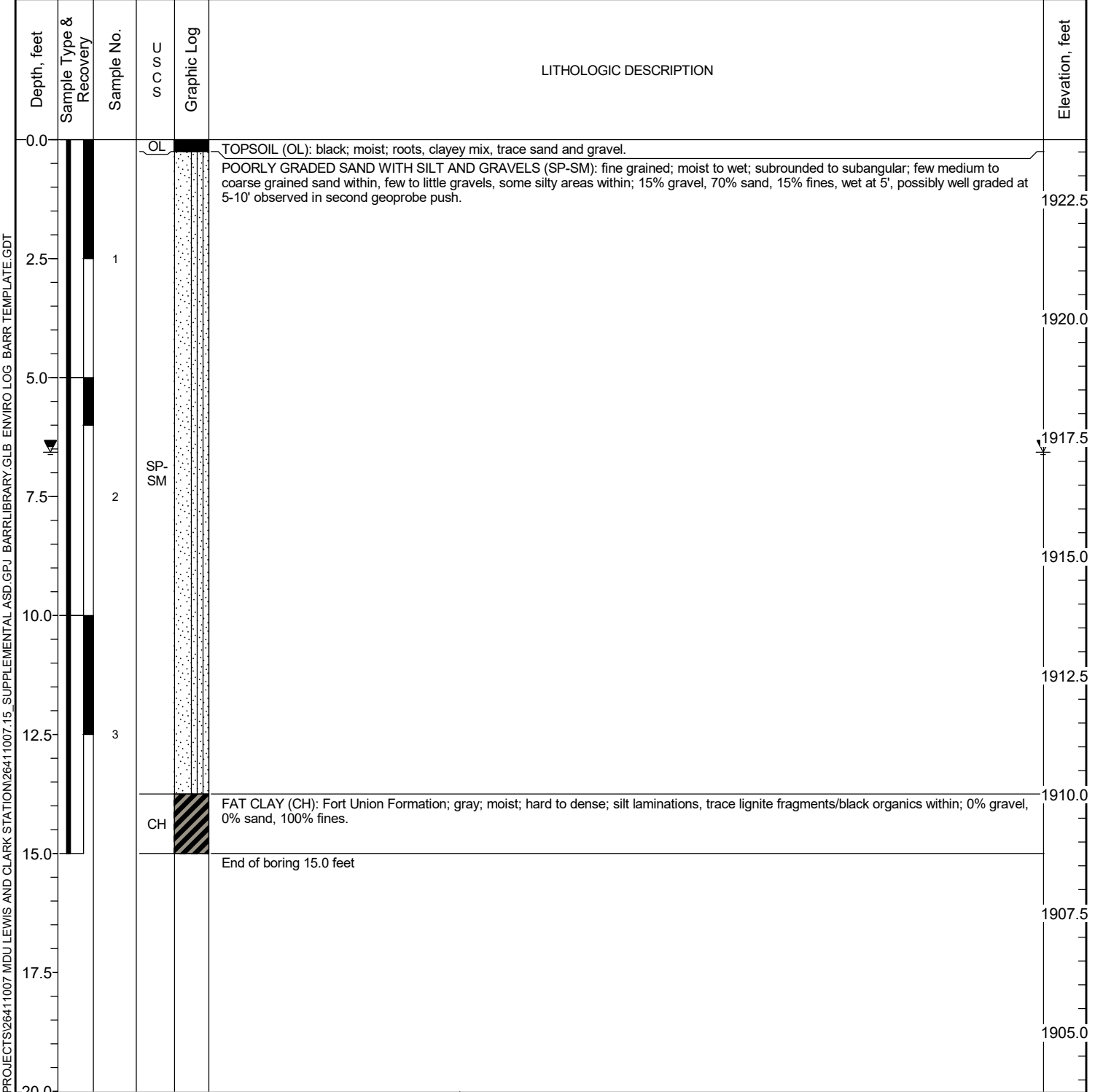


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LOG OF BORING T-21

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD Surface Elevation: 1923.8 ft
 Project No.: 26411007.15 Drilling Method: Geoprobe Direct-Push
 Location: Lewis and Clark Station, Sidney, MT Sampling Method: Geoprobe
 Coordinates: N 2,248,182.0 ft E 3,584,028.4 ft Completion Depth: 15.0 ft
 Datum: NAVD88



Date Boring Started: 4/6/20 3:55 pm
 Date Boring Completed: 4/6/20 4:45 pm
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 4-14' bgs, expendable point used.
 Second boring completed for additional sample recovery.

Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING T-22

DRAFT
 SHEET 1 OF 1

Project: Supplemental ASD
 Project No.: 26411007.15
 Location: Lewis and Clark Station, Sidney, MT
 Coordinates: N 2,248,814.6 ft E 3,584,890.5 ft
 Datum: NAVD88

Surface Elevation: 1912.6 ft
 Drilling Method: Geoprobe Direct-Push
 Sampling Method: Geoprobe
 Completion Depth: 20.0 ft

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Depth, feet	Sample Type & Recovery	Sample No.	U C S	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0					FILL; SANDY LEAN CLAY (CL): very dark gray to dark brown; moist; sand and gravel at surface - mixed within clay fill below surface; 10% gravel, 40% sand, 50% fines.	
1		1	CL			1910
5					FAT CLAY (CH): moist to wet; dense; hard and softer areas within, black organics and roots within; 0% gravel, 0% sand, 100% fines.	
2		2			8-9'; olive brown; more silty and saturated.	1905
10					9-12.5'; same as 3.5-8' but harder, soft at 12.5'; high plasticity.	
3		3	CH		12.5-14.5'; gray/dark gray to black; black organic/peat area with roots and shell fragments.	1900
15					14.5-15.5'; fine sand within the fat clay.	
4		4			15.5-20'; dark gray; wet, soft; high plasticity.	1895
20					End of boring 20.0 feet	

Date Boring Started: 4/7/20 11:35 am
 Date Boring Completed: 4/6/20 10:05 am
 Logged By: DJZ
 Drilling Contractor: AET
 Drill Rig:

Remarks: Temp well screen 3.5-18.5' bgs.

Additional data may have been collected in the field which is not included on this log.



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LOG OF BORING T-23

DRAFT
 SHEET 1 OF 1

Project:	Supplemental ASD	Surface Elevation:	1917.9 ft
Project No.:	26411007.15	Drilling Method:	Geoprobe Direct-Push
Location:	Lewis and Clark Station, Sidney, MT	Sampling Method:	Geoprobe
Coordinates:	N 2,248,816.0 ft E 3,585,392.7 ft	Completion Depth:	15.0 ft
Datum:	NAVD88		

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Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0.0			OL		TOPSOIL (OL): dark brown; moist; roots, clay with fine sand within.	1917.5
2.5		1	CL		SANDY LEAN CLAY (CL): very fine to fine grained; brown; moist; subangular to subrounded; trace medium to coarse sand, trace gravels; 4% gravel, 21% sand, 75% fines.	1915.0
5.0			ML		SANDY SILT (ML): pale olive to light yellowish brown; moist to wet; 0% gravel, 40% sand, 60% fines. 4.5-5.5'; dry/low moisture with areas of rusty oxidation stains throughout.	1912.5
7.5		2			6.5-8'; wet to saturated; gray mottles.	1910.0
10.0			ML		9.5-13.5'; areas of lean clay and silt laminations, trace siltstone fragments, dense/hard drilling.	1907.5
12.5		3				1905.0
15.0			CH		FAT CLAY (CH): olive yellow to light yellowish brown; moist; very hard to dense; mottled, with black organics or manganese oxidation stains; 0% gravel, 0% sand, 100% fines.	1902.5
15.0					End of boring 15.0 feet	1902.5
17.5						1900.0
20.0						

Date Boring Started:	4/7/20 1:10 pm	Remarks: Refusal at 15' bgs with very tough drilling from 10-15' bgs. Temp well screen 5-15' bgs. Borehole dry after temp well installed.
Date Boring Completed:	4/7/20 1:30 pm	
Logged By:	DJZ	
Drilling Contractor:	AET	
Drill Rig:		
		Additional data may have been collected in the field which is not included on this log.

Appendix B

Analytical Results



Date: 1/30/2020

CLIENT: Barr Engineering
Project: 26411007
Lab Order: S1912224

CASE NARRATIVE
Report ID: S1912224002
(Replaces S1912224001)

Samples SB-2, T-1, T-13 and T-2 were received on December 12, 2019.

All samples were received and analyzed within the EPA recommended holding times, except those noted below in this case narrative. Samples were analyzed using the methods outlined in the following references:

- "Standard Methods For The Examination of Water and Wastewater", approved method versions
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
40 CFR Parts 136 and 141
40 CFR Part 50, Appendices B, J, L, and O
Methods indicated in the Methods Update Rule published in the Federal Register Friday, May 18, 2012
ASTM approved and recognized standards

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

- S1912224-001 - SPLP/Lithium - Holding times for preparation or analysis exceeded
S1912224-001 - SPLP/Selenium - Holding times for preparation or analysis exceeded
S1912224-001 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
S1912224-001 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
S1912224-002 - SPLP/Lithium - Holding times for preparation or analysis exceeded
S1912224-002 - SPLP/Selenium - Holding times for preparation or analysis exceeded
S1912224-002 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
S1912224-002 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
S1912224-003 - SPLP/Lithium - Holding times for preparation or analysis exceeded
S1912224-003 - SPLP/Selenium - Holding times for preparation or analysis exceeded
S1912224-003 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
S1912224-003 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
S1912224-004 - SPLP/Lithium - Holding times for preparation or analysis exceeded
S1912224-004 - SPLP/Selenium - Holding times for preparation or analysis exceeded
S1912224-004 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
S1912224-004 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
S1912224-005 - SPLP/Lithium - Holding times for preparation or analysis exceeded
S1912224-005 - SPLP/Selenium - Holding times for preparation or analysis exceeded
S1912224-005 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
S1912224-005 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded
S1912224-006 - SPLP/Lithium - Holding times for preparation or analysis exceeded
S1912224-006 - SPLP/Selenium - Holding times for preparation or analysis exceeded
S1912224-006 - Total Metals-3050/6010/Lithium - Holding times for preparation or analysis exceeded
S1912224-006 - Total Metals-3050/6010/Selenium - Holding times for preparation or analysis exceeded

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/31/2019 10:00:00 AM

Project: 2641 1007
Lab ID: S1912224-001
Client Sample ID: SB-2
Depths: 2 - 5 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	11.5	0.2	H	mg/Kg	01/27/2020 1835 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1835 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1249 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1249 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/31/2019 10:05:00 AM

Project: 2641 1007
Lab ID: S1912224-002
Client Sample ID: SB-2
Depths: 10 - 20 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	4.9	0.2	H	mg/Kg	01/27/2020 1837 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1837 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1252 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1252 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/31/2019 3:20:00 PM

Project: 2641 1007
Lab ID: S1912224-003
Client Sample ID: T-1
Depths: 19 - 23 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	4.0	0.2	H	mg/Kg	01/27/2020 1839 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1839 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1254 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1254 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 2/1/2019 12:15:00 PM

Project: 2641 1007
Lab ID: S1912224-004
Client Sample ID: T-2
Depths: 23.5 - 30 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	18.1	0.2	H	mg/Kg	01/27/2020 1844 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1844 DG	EPA 6010C
SPLP						
Lithium	0.02	0.01	H	mg/L	01/09/2020 1256 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1256 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/30/2019 9:20:00 AM

Project: 2641 1007
Lab ID: S1912224-005
Client Sample ID: T-13
Depths: 3.5 - 10 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	16.2	0.2	H	mg/Kg	01/27/2020 1856 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1856 DG	EPA 6010C
SPLP						
Lithium	ND	0.01	H	mg/L	01/09/2020 1305 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1305 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

Work Order: S1912224
Collection Date: 1/30/2019 10:10:00 AM

Project: 2641 1007
Lab ID: S1912224-006
Client Sample ID: T-13
Depths: 15 - 20 Feet

Date Received: 12/12/2019
Sampler:
Matrix: Soil
COC: 58192

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Total Metals-3050/6010						
Lithium	22.7	0.2	H	mg/Kg	01/27/2020 1902 DG	EPA 6010C
Selenium	ND	1.3	H	mg/Kg	01/27/2020 1902 DG	EPA 6010C
SPLP						
Lithium	0.02	0.01	H	mg/L	01/09/2020 1307 DG	EPA 200.7
Selenium	ND	0.2	H	mg/L	01/09/2020 1307 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - ND Not Detected at the Reporting Limit
 - S Spike Recovery outside accepted recovery limits
 - X Matrix Effect

RL - Reporting Limit

- C Calculated Value
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL or is less than LCL
- O Outside the Range of Dilutions
- U Analysis reported under the reporting limit

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering
Work Order: S1912224
Project: 26411007

Date: 1/30/2020
Report ID: S1912224002
(Replaces S1912224001)

EPA 1312	Sample Type	MBLK	Units: mg/L				
SPLP BLK (01/09/20 13:09)	RunNo: 175360						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual

Lithium	ND	0.01					
Selenium	ND	0.2					

EPA 1312	Sample Type	DUP	Units: mg/L				
S1912224-004AD (01/09/20 12:58)	RunNo: 175360						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual

Lithium	0.03	0.01	0.02	54.8		20	HR
Selenium	ND	0.2	ND			20	H

Total (3050) Metals by ICP - 6010C	Sample Type	MBLK	Units: mg/Kg				
MB-17055 (01/27/20 17:49)	RunNo: 175797		PrepDate: 01/24/20 14:09		BatchID 17055		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual

Lithium	ND	0.2					
Selenium	ND	1.3					

Total (3050) Metals by ICP - 6010C	Sample Type	LCS	Units: mg/Kg				
LCS-17055 (01/27/20 17:56)	RunNo: 175797		PrepDate: 01/24/20 14:09		BatchID 17055		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual

Lithium	121	0.2	125		97.1	80 - 120	
Selenium	86.9	1.3	100		86.9	80 - 120	

Total (3050) Metals by ICP - 6010C	Sample Type	MS	Units: mg/Kg				
S1912224-004AS (01/27/20 18:51)	RunNo: 175797		PrepDate: 01/24/20 7:55		BatchID 17055		
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual

Lithium	136	0.2	125	18.1	94.0	75 - 125	H
Selenium	90.5	1.3	100	ND	90.5	75 - 125	H

Total (3050) Metals by ICP - 6010C	Sample Type	MSD	Units: mg/Kg				
S1912224-004AMSD (01/27/20 18:53)	RunNo: 175797		PrepDate: 01/24/20 7:55		BatchID 17055		
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual

Lithium	132	0.2	136	2.55	91.3	20	H
Selenium	88.8	1.3	90.5	1.88	88.8	20	H

Total (3050) Metals by ICP - 6010C	Sample Type	DUP	Units: mg/Kg				
S1912224-003AD (01/27/20 18:42)	RunNo: 175797		PrepDate: 01/24/20 7:55		BatchID 17055		
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual

Lithium	4.1	0.2	4.0	0.415		20	H
Selenium	ND	1.3	ND			20	H

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - ND Not Detected at the Reporting Limit
 - R RPD outside accepted recovery limits
 - X Matrix Effect
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits

Barr Engineering Co. Chain of Custody

Ann Arbor Duluth Hibbing KS MO UT
 Bismarck Grand Rapids Jefferson City MI ND WI
 Salt Lake City MN SD Other: **MT**

Sample Origination State:

REPORT TO

INVOICE TO

Company: **Barr Engineering Co**
 Address: **Bismarck ND**
 Name: **Scott Korum**
 email: **skorum@barr.com**
 Copy to: **datamgt@barr.com**

Company: **Barr Engineering Co**
 Address: **Bismarck ND**
 Name: **Scott Korum**
 email: **skorum@barr.com**
 P.O.

Project Name: **Confidential Li/se** Barr Project No: **26411077**

Location	Sample Depth		Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix Code	Analysis Requested		Preservative Code	Field Filtered Y/N
	Start	Stop				Water	Soil		
1. SB-2 (2-5')	2	5	01/31/2019	1000	S	NI	5112224-01		
2. SB-2 (10-20')	10	20	01/31/2019	1005	S	NI	-002		
3. T-1 (18-23')	19	23	01/31/2019	1520	S	NI	-003		
4. T-2 (23.5-30')	23.5	30	02/01/2019	1215	S	NI	-004		
5. T-13 (3.5-10')	3.5	10	01/30/2019	0920	S	NI	-005		
6. T-13 (15-20')	15	20	01/30/2019	1010	S	NI	-006		
7.									
8.									
9.									
10.									

Galton Bag

Analyze Lithium / Selenium per attached letter

Send Level 2 QC Report

Contact Scott Korum w/questions 701-221-5420

Total Number Of Containers Y / N

% Solids

Preservative Code Field Filtered Y/N

Matrix Code:
 GW = Groundwater
 SW = Surface Water
 WW = Waste Water
 DW = Drinking Water
 S = Soil/Solid
 SD = Sediment
 O = Other
Preservative Code:
 A = None
 B = HCl
 C = HNO₃
 D = H₂SO₄
 E = NaOH
 F = MeOH
 G = NaHSO₄
 H = Na₂S₂O₃
 I = Ascorbic Acid
 J = NH₄Cl
 K = Zn Acetate
 O = Other

COC Number: **58192**
COC **1** of **1**

Received by: **Kare A Seco**

Received by:

Time **1700**

Time

Date **12-0-19**

Date

On Ice? **Y**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

On Ice? **N**

Requested Due Date: Standard Turn Around Time Rush (mm/dd/yyyy)

Air Bill Number: **7772-0595-1920**

Custody Seal Intact? Y N None

Temperature on Receipt (°C):

Samples Shipped VIA: Courier Federal Express Other:

Lab Name: **Pace**

Lab Location: **Sheridan WY**

Barr DQ Manager: **TAD**

Barr Proj. Manager: **SFK**



Date: 8/7/2020

CLIENT: Barr Engineering
Project: Sediment Saturated Paste Extracts
Lab Order: S2007298

CASE NARRATIVE
Report ID: S2007298001

Samples T-14 (10-13), T-14 (5-7), T-14 (7-10), T-15 (10-14.25), T-15 (5-10), T-16 (11-13), T-17 (10.75-15), T-17 (5-10.75), T-18 (10-12.5), T-18 (12.5-14.5), T-18 (5-10), T-19 (10-14.5), T-19 (3.5-5), T-19 (5-10), T-20 (12.5-15), T-20 (3.5-5.5), T-20 (8.25-12.5), T-21 (13.75-15), T-21 (5-13.75), T-22 (10-15), T-22 (15-20), T-22 (3.5-10), T-23 (10-13.5), T-23 (13.5-15) and T-23 (4.5-10) were received on July 21, 2020.

Samples T-15 (14.25-17.5), T-16 (3-11), T-20 (5.5-8.25) were originally received April 14, 2020 and samples were requested to be analyzed with the current received samples.

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

- U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
- American Society of Agronomy, Number 9, Part 2, 1982
- USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
- Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
- New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
- State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
- Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
- State of Nevada Modified Sobek Procedure
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

- SATPASTE QC - Saturated Paste Metals by ICP/Boron - Spike Recovery outside accepted recovery limits
- SATPASTE QC - Saturated Paste Metals by ICP/Selenium - Spike Recovery outside accepted recovery limits



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-001
Client Sample ID: T-14 (5-7)
Depths: 5 - 7 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 17:22 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:22 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:22 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-002
Client Sample ID: T-14 (7-10)
Depths: 7 - 10 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 17:24 DG	EPA 200.7
Lithium	0.04	0.01		ppm	08/04/2020 17:24 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:24 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-003
Client Sample ID: T-14 (10-13)
Depths: 10 - 13 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 17:27 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:27 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:27 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-004
Client Sample ID: T-15 (5-10)
Depths: 5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.5	0.1		ppm	08/04/2020 17:29 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:29 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:29 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-005
Client Sample ID: T-15 (10-14.25)
Depths: 10 - 14.25 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 17:31 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:31 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:31 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-006
Client Sample ID: T-16 (11-13)
Depths: 11 - 13 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 17:33 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:33 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:33 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-007
Client Sample ID: T-17 (5-10.75)
Depths: 5 - 10.75 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 17:36 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:36 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:36 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298
Collection Date:

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-008
Client Sample ID: T-17 (10.75-15)
Depths: 10.75 - 15 Feet

Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50061

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/06/2020 16:15 DG	EPA 200.7
Lithium	0.07	0.01		ppm	08/06/2020 16:15 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:15 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-009
Client Sample ID: T-18 (5-10)
Depths: 5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.5	0.1		ppm	08/04/2020 17:45 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 17:45 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:45 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50061

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-010
Client Sample ID: T-18 (10-12.5)
Depths: 10 - 12.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 17:47 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:47 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:47 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-011
Client Sample ID: T-18 (12.5-14.5)
Depths: 12.5 - 14.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	1.2	0.1		ppm	08/04/2020 17:49 DG	EPA 200.7
Lithium	0.14	0.01		ppm	08/04/2020 17:49 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:49 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-012
Client Sample ID: T-19 (3.5-5)
Depths: 3.5 - 5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 17:51 DG	EPA 200.7
Lithium	0.06	0.01		ppm	08/04/2020 17:51 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:51 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-013
Client Sample ID: T-19 (5-10)
Depths: 5 - 10 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50062

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 17:54 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:54 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:54 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-014
Client Sample ID: T-19 (10-14.5)
Depths: 10 - 14.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 17:56 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 17:56 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:56 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-015
Client Sample ID: T-20 (3.5-5.5)
Depths: 3.5 - 5.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 17:58 DG	EPA 200.7
Lithium	0.04	0.01		ppm	08/04/2020 17:58 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 17:58 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298
Collection Date:

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-016
Client Sample ID: T-20 (8.25-12.5)
Depths: 8.25 - 12.5 Feet

Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50062

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/04/2020 18:00 DG	EPA 200.7
Lithium	0.01	0.01		ppm	08/04/2020 18:00 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:00 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-017
Client Sample ID: T-20 (12.5-15)
Depths: 12.5 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 18:03 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 18:03 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:03 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-018
Client Sample ID: T-21 (5-13.75)
Depths: 5 - 13.75 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50062

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/06/2020 16:20 DG	EPA 200.7
Lithium	0.05	0.01		ppm	08/06/2020 16:20 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:20 DG	EPA 200.7

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-019
Client Sample ID: T-21 (13.75-15)
Depths: 13.75 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 18:12 DG	EPA 200.7
Lithium	0.08	0.01		ppm	08/04/2020 18:12 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:12 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50062

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-020
Client Sample ID: T-22 (3.5-10)
Depths: 3.5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 18:14 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 18:14 DG	EPA 200.7
Selenium	0.14	0.05		ppm	08/04/2020 18:14 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-021
Client Sample ID: T-22 (10-15)
Depths: 10 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/04/2020 18:16 DG	EPA 200.7
Lithium	0.10	0.01		ppm	08/04/2020 18:16 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:16 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-022
Client Sample ID: T-22 (15-20)
Depths: 15 - 20 Feet

Work Order: S2007298
Collection Date:
Date Received: 7/21/2020
Sampler:
Matrix: Sediment
COC: 50063

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.5	0.1		ppm	08/04/2020 18:18 DG	EPA 200.7
Lithium	0.10	0.01		ppm	08/04/2020 18:18 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:18 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-023
Client Sample ID: T-23 (4.5-10)
Depths: 4.5 - 10 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 18:21 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/04/2020 18:21 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:21 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-024
Client Sample ID: T-23 (10-13.5)
Depths: 10 - 13.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.4	0.1		ppm	08/04/2020 18:23 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 18:23 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:23 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-025
Client Sample ID: T-23 (13.5-15)
Depths: 13.5 - 15 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.3	0.1		ppm	08/04/2020 18:25 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/04/2020 18:25 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/04/2020 18:25 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-026
Client Sample ID: T-15 (14.25-17.5)
Depths: 14.25 - 17.5 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.1	0.1		ppm	08/06/2020 16:24 DG	EPA 200.7
Lithium	0.04	0.01		ppm	08/06/2020 16:24 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:24 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-027
Client Sample ID: T-16 (3-11)
Depths: 3 - 11 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/06/2020 16:31 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/06/2020 16:31 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/06/2020 16:31 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/7/2020
Report ID: S2007298001

Work Order: S2007298

Collection Date:

Date Received: 7/21/2020

Sampler:

Matrix: Sediment

COC: 50063

Project: Sediment Saturated Paste Extracts
Lab ID: S2007298-028
Client Sample ID: T-20 (5.5-8.25)
Depths: 5.5 - 8.25 Feet

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.2	0.1		ppm	08/06/2020 16:34 DG	EPA 200.7
Lithium	0.02	0.01		ppm	08/06/2020 16:34 DG	EPA 200.7
Selenium	0.09	0.05		ppm	08/06/2020 16:34 DG	EPA 200.7

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering

Date: 8/7/2020

Work Order: S2007298

Report ID: S2007298001

Project: Sediment Saturated Paste Extracts

Saturated Paste Metals by ICP

Sample Type **MBLK**

Units: ppm

SATPASTE BLK (08/06/20 16:43)		RunNo: 181357						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	ND	0.1						
Lithium	ND	0.01						
Selenium	ND	0.05						

Saturated Paste Metals by ICP

Sample Type **LCS**

Units: ppm

SATPASTE QC (08/04/20 18:28)		RunNo: 181260						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	0.2	0.1	0.31		74.7	80 - 120	S	
Lithium	0.07	0.01	0.07		103	80 - 120		
Selenium	0.07	0.05	0.11		65.2	80 - 120	S	

QC-2 (08/06/20 16:40)		RunNo: 181357						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	0.2	0.1	0.31		76.5	80 - 120	S	
Lithium	0.07	0.01	0.07		98.2	80 - 120		
Selenium	0.12	0.05	0.11		106	80 - 120		

Saturated Paste Metals by ICP

Sample Type **DUP**

Units: ppm

S2007298-008AD (08/06/20 16:18)		RunNo: 181357						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.2	0.1	0.3	1.55		20		
Lithium	0.07	0.01	0.07	1.20		20		
Selenium	0.08	0.05	ND			20	R	

S2007298-018AD (08/06/20 16:22)		RunNo: 181357						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.3	0.1	0.3	3.28		20		
Lithium	0.05	0.01	0.05	0.167		20		
Selenium	ND	0.05	ND			20		

S2007298-028AD (08/06/20 16:36)		RunNo: 181357						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.2	0.1	0.2	7.47		20		
Lithium	0.02	0.01	0.02	0.0234		20		
Selenium	ND	0.05	0.09			20		

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits

- D Report limit raised due to dilution
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- X Matrix Effect

Chain of Custody for Air Canisters

Sample Origination State:
 KS MO WI
 MI ND MN
 MN SD IA

Ann Arbor
 Bismarck
 Duluth
 Hibbing

REPORT TO

INVOICE TO

Company: **BARR ENGINEERING**
 Address: **234 W. CENTURY**
 Name: **SCOTT KORUM**
 email: **skorum@barr.com**
 Copy to: **datamgt@barr.com**

Company:
 Address:
 Name: **SAME**
 email:
 P.O.
 Barr Project No:

Location	Canister		Flow Controller Serial #	Vacuum		Collection Date (mm/dd/yyyy)	Collection Time		Total Time	Matrix Code	PID Reading (ppm/ppb)	Sample Comments	
	Serial #	Size		Initial	Final		Start (hh:mm)	Stop (hh:mm)					
1. T-14 (5-7')	52007298	001	0018		4/2020					SD		SEE ATTACHED	
2. T-14 (7-10')		002								SD		LETTER FOR DETAILS	
3. T-14 (10-13')		003								SD			
4. T-15 (5-10')		004								SD			
5. T-15 (10-14.25')		005								SD		CONTACT SCOTT	
6. T-16 (11-13')		006								SD		KORUM W/ QUESTIONS	
7. T-17 (5-12.75')		007								SD			
8. T-17 (10.75-15')		008								SD		701-335-3125	
9. T-18 (5-10')		009								SD			
10. T-18 (10-12.5')		010								SD			
BARR USE ONLY													
Sampled by:	Relinquished by: SCOTT KORUM										Received by: KAREN ALLEN	Date: 7/6/20	Time: 1030
Barr Proj. Manager: JEREMY GARNIK	Relinquished by:										Received by:	Date:	Time:
Barr DQ Manager:	Samples Shipped VIA: <input checked="" type="checkbox"/> Federal Express <input type="checkbox"/> Courier <input type="checkbox"/> Other:										Air Bill Number:	Requested Due Date: <input type="checkbox"/> Standard Turn Around Time <input type="checkbox"/> Rush (mm/dd/yyyy)	
Lab Name:	Custody Seal Intact? <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> None												
Lab Location:													

Distribution - White-Original: Accompanies Shipment to Laboratory; Yellow Copy: Include in Field Documents; Pink Copy: Send to Data Management Administrators.

Chain of Custody for Air Canisters

REPORT TO

Company: **BARR**
 Address: **234 W. CENTINAY**
 Name: **SA SCOTT KOREM**
 email: **SADRON@BARR.COM**
 Copy to: **datamgt@barr.com**

INVOICE TO

Company: _____
 Address: _____
 Name: **SCOTT KOREM**
 email: _____
 P.O. _____

Sample Origination State:
 KS MO WI
 MI ND MA
 MN SD

Analysis Requested:
 TO-14 TO-15 TO-15SIM
 3C Other

Lab Deliverable Contents:
 (check all that apply)
 Sample Data with QC
 TIC Library Search
 Sample Chromatograms
 Individual Canister Certification Data
 EDD: _____
 EQUS EQUS-LITE
 TIC results in EDD
 Other: _____

COC Number: **No 50062**
 COC **2** of **3**

Matrix Code:
 AA = Ambient Air (Indoor/Outdoor)
 SV = Soil Vapor/Landfill Gas/SVE
 Other: **SD = SEDIMENTS**

Project Name:	Location	Canister Serial #	Canister Size	Flow Controller Serial #	Vacuum		Collection Date (mm/dd/yyyy)	Collection Time		Total Time	Matrix Code	PID Reading (ppm/ppb)	Sample Comments
					Initial	Final		Start (hh:mm)	Stop (hh:mm)				
	7.11 T-18 (12.5-14.5')	52007298-011					09/2020				SD		SEE ATTACHED LETTER
	7.12 T-19 (3.5-5')			012							SD		
	7.13 T-19 (5-10')			013							SD		
	7.14 T-19 (10-14.5')			014							SD		
	7.15 T-20 (3.5-5.5')			015							SD		
	7.16 T-20 (8.25-12.5')			016							SD		SCOTT KOREM FOI-335-3125
	7.17 T-20 (12.5-15')			017							SD		
	7.18 T-21 (5-13.75')			018							SD		
	7.19 T-21 (13.75-15')			019							SD		
	7.20 T-22 (3.5-10')			020							SD		

Relinquished by: **SCOTT KOREM** Date: **7/17/20** Time: _____
Relinquished by: _____ Date: _____ Time: _____

Received by: **KAREN** Date: **7/20/20** Time: **1030**
Received by: _____ Date: _____ Time: _____

Requested Due Date:
 Standard Turn Around Time
 Rush (mm/dd/yyyy)

Lab WO: _____
Lab Location: _____

Project Name: _____
Company: _____
Address: _____
Name: **J. GACNIK**
email: _____
Copy to: _____

Chain of Custody for Air Canisters

Ann Arbor
 Bismarck

Duluth
 Hibbing

Jefferson City
 Minneapolis

Sample Origination State:
 KS MO WI
 MI ND Other: MT

REPORT TO

INVOICE TO

Company: BARR
 Address: 234 W. CENTURY
 Name: SCOTT KORDAN
 email: SKORDAN@BARR.COM
 Copy to: datamgt@barr.com

Company: SPANE
 Address: SPANE
 Name: SPANE
 email: SPANE
 P.O. SPANE

Barr Project No:

Location	Canister		Flow Controller Serial #	Vacuum		Collection Date (mm/dd/yyyy)	Collection Time		Matrix Code	PID Reading (ppm/ppb)	Sample Comments
	Serial #	Size		Initial	Final		Start (hh:mm)	Stop (hh:mm)			
X21 T-22(10-15')	S2007298	021	021		04/20/20				SD		SEE ATTACHED LETTER
X22 T-22(15-20')			022						SD		
X23 T-23(4.5-10')			023						SD		
X24 T-23(10-13.5')			024						SD		
X25 F-23(13.5-15')			025						SD		SCOTT KORDAN FDI-335-3125
6.											
7.											
8.											
9.											
10.											

BARR USE ONLY

Sampled by: _____
 Barr Proj. Manager: J. GARNIK
 Barr DQ Manager: _____
 Lab Name: _____
 Lab Location: _____

Relinquished by: SCOTT KORDAN
 Relinquished by: _____

Received by: KAREN SEA
 Received by: _____

Date: 7/20/20 Date: 7/20/20
 Time: _____ Time: 1030

Samples Shipped VIA: Courier Federal Express Sampler
 Other: _____

Lab WO: _____ Custody Seal Intact? Y N None

Requested Due Date: _____
 Standard Turn Around Time
 Rush (mm/dd/yyyy)



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2616 East Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724
1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W185
Work Order #:82-0201
Account #: 013200
Date Sampled: 31 Jan 19 14:50
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-3

Temp at Receipt: 2.5C

Table with 6 columns: As Received Result, Method RL, Method Reference, Date Analyzed, Analyst. Rows include Metal Digestion, pH - Field, Lithium - Total, and Selenium - Total.

Approved by: Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W186
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 14:05
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-4

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.27	units	NA	SM 4500 H+ B	31 Jan 19 14:05	
Lithium - Total	0.180	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	0.0192	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W187
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 11:00
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-7

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.31	units	NA	SM 4500 H+ B	31 Jan 19 11:00	
Temperature - Field	1.84	Degrees C	NA	SM 2550B	31 Jan 19 11:00	
Lithium - Total	0.148	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	0.0959	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W188
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 16:40
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-8

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	6.64	units	NA	SM 4500 H+ B	31 Jan 19 16:40	
Lithium - Total	0.165	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Cc
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W190
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 18:00
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-11

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.01	units	NA	SM 4500 H+ B	31 Jan 19 18:00	
Lithium - Total	0.650	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	0.1026	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

C
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W191
Work Order #: 82-0201
Account #: 013200
Date Sampled: 31 Jan 19 15:50
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-13

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	7.80	units	NA	SM 4500 H+ B	31 Jan 19 15:50	
Lithium - Total	0.121	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{cc} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W192
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 10:25
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-1

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
pH - Field	6.90	units	NA	SM 4500 H+ B	1 Feb 19 10:25	
Lithium - Total	0.048	mg/l	0.020	6010D	7 Feb 19 11:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Cc
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com



Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W195
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 18:20
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-6

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	0.116 mg/l		0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005 mg/l		0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com



Page: 1 of 1

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W196
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 18:00
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: T-12

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	0.270	mg/l	0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	0.0056	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com



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Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 12 Feb 19
Lab Number: 19-W198
Work Order #: 82-0201
Account #: 013200
Date Sampled: 1 Feb 19 15:20
Date Received: 4 Feb 19 16:56
Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: Field Blank

Temp at Receipt: 2.5C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	5 Feb 19	SVS
Lithium - Total	< 0.02	mg/l	0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005	mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

Claudette K. Carroll ^{CC} 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
⊗ = Due to sample matrix # = Due to concentration of other analytes
: = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



MINNESOTA VALLEY TESTING LABORATORIES, INC.

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 2 North German St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
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 1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
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Page: 1 of 1

Terri Olson
 Barr Engineering Company
 4300 MarketPointe Drive, Suite 200
 Minneapolis MN 55435

Report Date: 12 Feb 19
 Lab Number: 19-W199
 Work Order #: 82-0201
 Account #: 013200
 Date Sampled: 1 Feb 19 15:30
 Date Received: 4 Feb 19 16:56
 Sampled By: Client

Project Name: MDU Lewis & Clark

PO #: 26411007.10

Sample Description: Equipment Blank

Temp at Receipt: 2.5C

	As Received Result	Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion			EPA 200.2	5 Feb 19	SVS
Lithium - Total	< 0.02 mg/l	0.020	6010D	7 Feb 19 12:43	FFP
Selenium - Total	< 0.005 mg/l	0.0050	6020B	12 Feb 19 12:19	BMB

Approved by:

CC
Claudette K. Carroll 12 Feb 19

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
 @ = Due to sample matrix # = Due to concentration of other analytes
 ! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016

Quality Control Report

Lab IDs: 19-W185 to 19-W199

Page: 1 of 1

Project: MDU Lewis & Clark Work Order: 201982-0201

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Rec %	Matrix Spike Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD/ Dup RPD	MSD Rec %	MSD/ Dup RPD Limit (<=)	Known Rec (%)	Known % Rec Limits	Method Blank
Lithium - Total mg/l	0.400	99	80-120	0.400 0.400	19-W187 19-W197	0.148 0.048	105 101	75-125 75-125	0.567 0.453	0.552 0.466	2.7 2.8	101 104	20 20	- -	- -	<0.02 <0.02 <0.02
Selenium - Total mg/l	0.1000	106	80-120	0.400 0.100	19-W187 19-W195	0.0959 <0.005	108 97	75-125 75-125	0.5280 0.0968	0.5252 0.0939	0.5 3.0	107 94	20 20	- -	- -	<0.005

Samples were received in good condition on 4 Feb 2019 at 1656.

Temperature upon receipt at the Bismarck laboratory was 2.5°C. Samples were received on ice and evidence of cooling had begun.

All samples were properly preserved unless noted here and/or flagged on the individual analytical laboratory report.

Approved methodology was followed for all sample analyses.

All acceptance criteria were met for calibration, method blanks, laboratory control samples, laboratory fortified matrix/duplicates unless noted here.

Approved by: C. Gustaf
12 Feb A

* Rush Li and Se Samples!

82-0201

Barr Engineering Co. Chain of Custody

Ann Arbor
 Bismarck
 Duluth
 Hibbing
 Jefferson City
 Minneapolis

Sample Origination State:
 KS MO WI
 MI ND
 MN SD
 Other: MT

REPORT TO
 Company: Barr Engineering
 Address: 234 W. Century Ave
 Name: Terrri Olson
 email: Tolson@barr.com
 Copy to: datamgt@barr.com

INVOICE TO
 Company: Same
 Address: Same
 Name: Same
 email: Same
 P.O. Same

Project Name: MPU Lewis and Clark Barr Project No: 26411007.10

Location	Sample Depth		Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix Code	Performs MS/MSD Y / N	Analysis Requested		% Solids	Preservative Code	Field Filtered Y/N
	Start	Stop					Water	Soil			
1. T-3 w185	NA	1	01/31/2019	13:50	GW	N					
2. T-4 w186	NA	1		13:05		N					
3. T-7 w187	NA	1		10:00		Y					
4. T-8 w188	NA	1		15:40		N					
5. T-9 w189	NA	1		09:00		N					
6. T-11 w190	NA	1		17:00		N					
7. T-13 w191	NA	1		14:50		N					
8.				*MPT							
9.											
10.											

BARR USE ONLY
 Relinquished by: Matt Am Date: 2-4-19
 Relinquished by: _____ Date: _____
 Samples Shipped VIA: Courier Federal Express Sampler
 Other: _____
 Lab WO: Bismarck, ND Temperature on Receipt (°C): _____
 Custody Seal Intact? Y N None
 Air Bill Number: _____
 Received by: [Signature] Date: 4 Feb 2019 Time: 11:56
 Received by: _____ Date: _____ Time: _____
 Requested Due Date: _____
 Standard Turn Around Time
 Rush (mm/dd/yyyy)



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W635
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 12:02
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-15
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.042	mg/l	0.020	6010D	15 Apr 20 11:09	MDE
Boron - Total	0.18	mg/l	0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005	mg/l	0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

CC
Claudette K. Carroll | Jul 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W636
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 13:30
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-16
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.045 mg/l		0.020	6010D	15 Apr 20 11:09	MDE
Boron - Total	0.15 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by: Claudette K Carroll ^{CC} 1 Jul 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity † = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W637
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 15:45
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-18
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.044 mg/l		0.020	6010D	15 Apr 20 11:09	MDE
Boron - Total	0.13 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	0.0090 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

CC
Claudette K. Carroll 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W638
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 16:45
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-17
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.033 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.16 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll ^{CC} 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W639
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 17:33
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-21
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.041 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.19 mg/l		0.10	6010D	16 Apr 20 11:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll

CC
1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
: = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W640
Work Order #: 82-0830
Account #: 013200
Date Sampled: 6 Apr 20 19:10
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-19
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.036 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.16 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carrö ^{CL} 1 JUL 2020

Claudette K. Carrö, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity * = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W642
Work Order #: 82-0830
Account #: 013200
Date Sampled: 7 Apr 20 12:45
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-20
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.070 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.21 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll ^{CC} 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W643
Work Order #: 82-0830
Account #: 013200
Date Sampled: 8 Apr 20 8:25
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-22
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.077 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.38 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	0.0077 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll

*CC
1 Jul 2020*

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:

@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W644
Work Order #: 82-0830
Account #: 013200
Date Sampled: 8 Apr 20 9:00
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-23
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	14 Apr 20	HT
Lithium - Total	0.535	mg/l	0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.58	mg/l	0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	0.0352	mg/l	0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

Claudette K. Carroll

CC
1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity * = Due to internal standard response

CERTIFICATION: ND # ND-00016



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Page: 1 of 1

Selenium Added 11Jun2020

Terri Olson
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Minneapolis MN 55435

Report Date: 20 Apr 20
Lab Number: 20-W645
Work Order #: 82-0830
Account #: 013200
Date Sampled:
Date Received: 9 Apr 20 15:05
Sampled By: Client

Project Name: 26411007.15
Sample Description: T-D
Sample Site: MDU L&C

Temp at Receipt: 0.4C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Metal Digestion				EPA 200.2	9 Apr 20	HT
Lithium - Total	0.044 mg/l		0.020	6010D	15 Apr 20 12:09	MDE
Boron - Total	0.16 mg/l		0.10	6010D	16 Apr 20 12:42	MDE
Selenium - Total	< 0.005 mg/l		0.0050	6020B	17 Jun 20 9:48	MDE

Approved by:

CC
Claudette K Carroll 1 JUL 2020

Claudette K. Carroll, Laboratory Manager, Bismarck, ND

RL = Method Reporting Limit

The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response

CERTIFICATION: ND # ND-00016

Quality Control Report - Amended

Lab IDs: 20-W635 to 20-W646 Project: 26411007.15 Work Order: 202082-0830

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Rec %	Matrix Spike % Rec Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD Rec %	MSD/ Dup RPD Limit (<)	Known Rec (%)	Known % Rec Limits	Method Blank
Boron - Total mg/l	0.40	92	80-120	0.400	20-D1057	0.32	108	75-125	0.75	0.75	108	20	-	-	< 0.1
	0.40	90	80-120	0.400	20-D1072	0.13	100	75-125	0.53	0.54	102	20	-	-	< 0.1
	0.40	92	80-120	0.400	20-D1132	1.56	120	75-125	2.04	1.97	102	20	-	-	< 0.1
	0.40	90	80-120	0.400	20-W638	0.16	102	75-125	0.57	0.57	102	20	-	-	< 0.1
	0.40	90	80-120	0.400	20-W646	<0.1	78	75-125	0.31	0.30	75	20	-	-	< 0.1
Lithium - Total mg/l	0.400	102	80-120	0.400	20-W578	<0.02	103	75-125	0.411	0.402	100	20	-	-	< 0.02
	0.400	99	80-120	0.400	20-W638	0.033	108	75-125	0.464	0.465	108	20	-	-	< 0.02
Selenium - Total mg/l	0.1000	101	80-120	0.400	20W635q	<0.005	101	75-125	0.4034	0.4102	103	20	-	-	< 0.005
				0.400	20W645q	<0.005	103	75-125	0.4138	0.4562	114	20	-	-	< 0.02

Samples were received in good condition on 9 Apr 2020 at 1505. Temperature upon receipt at the Bismarck laboratory was 0.4°C. All samples were properly preserved unless noted here and/or flagged on the individual analytical laboratory report. All holding times were met.

Approved methodology was followed for all sample analyses. All acceptance criteria were met for calibration, method blanks, laboratory control samples, laboratory fortified matrix/duplicates unless noted here. Per email from Terri Olson with Barr dated 11 Jun 2020, selenium was added to the samples.

Approved by: C. Cantel
1 Jul 2020

Claudette Carroll

From: Terri A. Olson <TOlson@barr.com>
Sent: Thursday, June 11, 2020 11:15 AM
To: Claudette Carroll
Subject: RE: 202082-0830 BARR.pdf

Hi Claudette,

Glad that Scott requested this. Please analyze selenium by EPA 6020B on all 10 samples.

Thanks Claudette.

Terri A. Olson
Senior Data Quality Specialist
Minneapolis, MN office: 952.842.3578
TOlson@barr.com
www.barr.com

resourceful. naturally.



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From: Claudette Carroll <ccarroll@mvtl.com>
Sent: Thursday, June 11, 2020 9:46 AM
To: Terri A. Olson <TOlson@barr.com>
Subject: RE: 202082-0830 BARR.pdf

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Terri,

Cost of selenium would be \$18 per sample. Per an earlier request by Scott Korum, we have held onto these samples and will be able to run them for selenium, if requested.

Claudette



**Minnesota Valley Testing
Laboratories, Inc.**

Providing Analytical Excellence Since 1951

ccarroll@mvtl.com
701-258-9720

2616 E. Broadway Ave/Bismarck, ND 58501
#NDSmart, #NDStrong, #InThisTogether

From: Terri A. Olson <TOlson@barr.com>
Sent: Thursday, June 11, 2020 8:17 AM
To: Claudette Carroll <ccarroll@mvtl.com>
Subject: 202082-0830 BARR.pdf

Hi Claudette,

We are thinking about having selenium analyzed for the samples in the attached report. Do you have any sample left? Based on past work, I believe we would want the selenium by 6020 and the B and Li were by 6010 so reporting from the same run isn't an optino. If you have sample, what would be the associated cost for Se by 6020?

Thank-you,

Terri A. Olson
Senior Data Quality Specialist
Minneapolis, MN office: 952.842.3578
TOlson@barr.com
www.barr.com

resourceful. naturally.



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82-0830

Barr Engineering Co. Chain of Custody

Ann Arbor
 Bismarck
 Duluth
 Hibbing
 Jefferson City
 Minneapolis

REPORT TO

Company: Barr Engineering
 Address: 234 W Century Ave
 Name: TERRI OLSON
 email: tolson@barr.com
 Copy to: datamgt@barr.com
 Project Name: MDU LFC

INVOICE TO

Company: Same
 Address: Same
 Name: Same
 email: Same
 PO: Same
 Barr Project No: 2641007-15

Analysis Requested
 Water: _____
 Soil: _____
 % Solids: _____

Total Number Of Containers: 2
 Perform MS/MSD Y/N: (N)
 Matrix Code: GW
 Preservative Code: L

Sample Depth	Start	Stop	Unit (m./ft or in.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix Code
1. T-D	wob	---	---	---	---	GW
2. T-RB	wetle	---	---	---	---	L
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Total Number Of Containers: 2
 Perform MS/MSD Y/N: (N)
 Matrix Code: GW
 Preservative Code: L

Relinquished by: Monty Barr
 Relinquished by: _____
 Samples Shipped VIA: Courier Federal Express Sampler
 Lab WO: Bismarck, ND

Relinquished by: Monty Barr
 Relinquished by: _____
 Samples Shipped VIA: Courier Federal Express Sampler
 Lab WO: Bismarck, ND

Sample Origination State: KS MO WI MI ND MN SD Other: MT

COC Number: **54258**
 COC 2 of 2
 Matrix Code: _____
 Preservative Code: _____

Received by: Terri Olson
 Received by: _____
 Air Bill Number: _____
 Requested Due Date: 15-05
 Standard Turn Around Time
 Rush (mm/dd/yyyy)

Date: 4-9-2008
 Date: _____
 Time: 15:05
 Time: _____

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Date: 8/26/2020

CLIENT: Barr Engineering
Project: 26411007.15
Lab Order: S2008131

CASE NARRATIVE
Report ID: S2008131001

Samples COAL PILE COAL 2, SB-2 20.5-21, T-17 10.75-15, T-18 12.5-14.5, T-2 22.5-23.5, T-22 10-15, T-3 30-32.5, T-5 10-15 and T-6 19.5-20 were received on August 6, 2020.

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

- U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
- American Society of Agronomy, Number 9, Part 2, 1982
- USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
- Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
- New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
- State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
- Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
- State of Nevada Modified Sobek Procedure
- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

SATPASTE QC - Saturated Paste Metals by ICP/Boron - Spike Recovery outside accepted recovery limits

Please note that during sample preparation for total metals analysis, a standard was used which did not contain lithium. This was not discovered until the samples were analyzed on August 25. Therefore, there is no spike QC data for lithium, but all QC for boron and selenium are present and acceptable.

Reviewed by:

Karen A Secor

Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-001
Client Sample ID: SB-2 20.5-21
Depths: 20.5 - 21 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	9.4	0.1		ppm	08/20/2020 16:17 DG	EPA 200.7
Lithium	0.11	0.01		ppm	08/20/2020 16:17 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/20/2020 16:17 DG	EPA 200.7
Total Metals-3050/6010						
Boron	59	5		mg/Kg	08/25/2020 15:46 DG	EPA 6010C
Lithium	1.8	0.2		mg/Kg	08/25/2020 15:46 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 15:46 DG	EPA 6010C

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-002
Client Sample ID: T-2 22.5-23.5
Depths: 22.5 - 23.5 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	3.2	0.1		ppm	08/20/2020 16:19 DG	EPA 200.7
Lithium	0.07	0.01		ppm	08/20/2020 16:19 DG	EPA 200.7
Selenium	0.13	0.05		ppm	08/20/2020 16:19 DG	EPA 200.7
Total Metals-3050/6010						
Boron	42	5		mg/Kg	08/25/2020 15:50 DG	EPA 6010C
Lithium	5.0	0.2		mg/Kg	08/25/2020 15:50 DG	EPA 6010C
Selenium	2.9	1.3		mg/Kg	08/25/2020 15:50 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-003
Client Sample ID: T-3 30-32.5
Depths: 30 - 32.5 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	1.5	0.1		ppm	08/20/2020 16:21 DG	EPA 200.7
Lithium	0.13	0.01		ppm	08/20/2020 16:21 DG	EPA 200.7
Selenium	0.07	0.05		ppm	08/20/2020 16:21 DG	EPA 200.7
Total Metals-3050/6010						
Boron	33	5		mg/Kg	08/25/2020 15:59 DG	EPA 6010C
Lithium	13.4	0.2		mg/Kg	08/25/2020 15:59 DG	EPA 6010C
Selenium	3.1	1.3		mg/Kg	08/25/2020 15:59 DG	EPA 6010C

These results apply only to the samples tested.

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

RL - Reporting Limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-004
Client Sample ID: T-5 10-15
Depths: 10 - 15 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.8	0.1		ppm	08/20/2020 16:24 DG	EPA 200.7
Lithium	0.09	0.01		ppm	08/20/2020 16:24 DG	EPA 200.7
Selenium	0.06	0.05		ppm	08/20/2020 16:24 DG	EPA 200.7
Total Metals-3050/6010						
Boron	33	5		mg/Kg	08/25/2020 16:02 DG	EPA 6010C
Lithium	15.9	0.2		mg/Kg	08/25/2020 16:02 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:02 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-005
Client Sample ID: T-6 19.5-20
Depths: 19.5 - 20 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.6	0.1		ppm	08/20/2020 16:26 DG	EPA 200.7
Lithium	0.08	0.01		ppm	08/20/2020 16:26 DG	EPA 200.7
Selenium	0.09	0.05		ppm	08/20/2020 16:26 DG	EPA 200.7
Total Metals-3050/6010						
Boron	25	5		mg/Kg	08/25/2020 16:04 DG	EPA 6010C
Lithium	18.8	0.2		mg/Kg	08/25/2020 16:04 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:04 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-006
Client Sample ID: T-17 10.75-15
Depths: 10.75 - 15 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	2.2	0.1		ppm	08/20/2020 16:30 DG	EPA 200.7
Lithium	0.10	0.01		ppm	08/20/2020 16:30 DG	EPA 200.7
Selenium	0.06	0.05		ppm	08/20/2020 16:30 DG	EPA 200.7
Total Metals-3050/6010						
Boron	44	5		mg/Kg	08/25/2020 16:06 DG	EPA 6010C
Lithium	13.3	0.2		mg/Kg	08/25/2020 16:06 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:06 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-007
Client Sample ID: T-18 12.5-14.5
Depths: 12.5 - 14.5 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	3.3	0.1		ppm	08/20/2020 16:32 DG	EPA 200.7
Lithium	0.09	0.01		ppm	08/20/2020 16:32 DG	EPA 200.7
Selenium	0.07	0.05		ppm	08/20/2020 16:32 DG	EPA 200.7
Total Metals-3050/6010						
Boron	47	5		mg/Kg	08/25/2020 16:08 DG	EPA 6010C
Lithium	12.6	0.2		mg/Kg	08/25/2020 16:08 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:08 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-008
Client Sample ID: T-22 10-15
Depths: 10 - 15 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	0.9	0.1		ppm	08/20/2020 16:35 DG	EPA 200.7
Lithium	0.06	0.01		ppm	08/20/2020 16:35 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/20/2020 16:35 DG	EPA 200.7
Total Metals-3050/6010						
Boron	34	5		mg/Kg	08/25/2020 16:10 DG	EPA 6010C
Lithium	12.4	0.2		mg/Kg	08/25/2020 16:10 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:10 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Sample Analysis Report

CLIENT: Barr Engineering
Bismark, ND

Date Reported: 8/26/2020
Report ID: S2008131001

Project: 26411007.15
Lab ID: S2008131-009
Client Sample ID: COAL PILE COAL 2
Depths: 0 - 0 Feet

Work Order: S2008131
Collection Date:
Date Received: 8/6/2020
Sampler:
Matrix: Solid
COC: 58270

Analyses	Result	RL	Qual	Units	Date Analyzed/Init	Method
Saturated Paste Metals						
Boron	2.6	0.1		ppm	08/20/2020 16:37 DG	EPA 200.7
Lithium	0.03	0.01		ppm	08/20/2020 16:37 DG	EPA 200.7
Selenium	ND	0.05		ppm	08/20/2020 16:37 DG	EPA 200.7
Total Metals-3050/6010						
Boron	63	5		mg/Kg	08/25/2020 16:15 DG	EPA 6010C
Lithium	1.3	0.2		mg/Kg	08/25/2020 16:15 DG	EPA 6010C
Selenium	ND	1.3		mg/Kg	08/25/2020 16:15 DG	EPA 6010C

These results apply only to the samples tested.

RL - Reporting Limit

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - D Report limit raised due to dilution
 - G Analyzed at IML Gillette laboratory
 - J Analyte detected below quantitation limits
 - M Value exceeds Monthly Ave or MCL or is less than LCL
 - O Outside the Range of Dilutions
 - U Analyte below method detection limit

- C Calculated Value
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- L Analyzed by another laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits
- X Matrix Effect

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering

Date: 8/26/2020

Work Order: S2008131

Report ID: S2008131001

Project:

Saturated Paste Metals by ICP

Sample Type **MBLK**

Units: ppm

SATPASTE BLK (08/20/20 16:46)		RunNo: 181804						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	ND	0.1						
Lithium	ND	0.01						
Selenium	ND	0.05						

Saturated Paste Metals by ICP

Sample Type **LCS**

Units: ppm

SATPASTE QC (08/20/20 16:44)		RunNo: 181804						
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual	
Boron	0.4	0.1	0.31		124	80 - 120	S	
Lithium	0.08	0.01	0.07		116	80 - 120		
Selenium	0.10	0.05	0.11		86.7	80 - 120		

Saturated Paste Metals by ICP

Sample Type **DUP**

Units: ppm

S2008131-005AD (08/20/20 16:28)		RunNo: 181804						
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual	
Boron	0.6	0.1	0.6	7.17		20		
Lithium	0.08	0.01	0.08	5.44		20		
Selenium	0.07	0.05	0.09	24.9		20	R	

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits

- D Report limit raised due to dilution
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- X Matrix Effect



ANALYTICAL QC SUMMARY REPORT

CLIENT: Barr Engineering

Date: 8/26/2020

Work Order: S2008131

Report ID: S2008131001

Project:

Total (3050) Metals by ICP - 6010C

Sample Type MBLK

Units: mg/Kg

MB-17637 (08/25/20 14:57)	RunNo: 181916	PrepDate: 08/20/20 17:23	BatchID 17637				
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Boron	ND	5					
Lithium	ND	0.2					
Selenium	ND	1.3					

Total (3050) Metals by ICP - 6010C

Sample Type LCS

Units: mg/Kg

LCS-17637 (08/25/20 14:59)	RunNo: 181916	PrepDate: 08/20/20 17:23	BatchID 17637				
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Boron	47	5	50		93.9	80 - 120	
Selenium	48.8	1.3	50		97.6	80 - 120	

Total (3050) Metals by ICP - 6010C

Sample Type MS

Units: mg/Kg

S2008131-009AS (08/25/20 16:17)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Spike	Ref Samp	%REC	% Rec Limits	Qual
Boron	108	5	50	63	91.2	75 - 125	
Selenium	41.2	1.3	50	ND	82.4	75 - 125	

Total (3050) Metals by ICP - 6010C

Sample Type MSD

Units: mg/Kg

S2008131-009AMSD (08/25/20 16:26)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Conc	%RPD	%REC	% RPD Limits	Qual
Boron	105	5	108	2.88	85.0	20	
Selenium	40.0	1.3	41.2	2.96	80.0	20	

Total (3050) Metals by ICP - 6010C

Sample Type DUP

Units: mg/Kg

S2008131-001AD (08/25/20 15:48)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Boron	61	5	59	3.10		20	
Lithium	1.7	0.2	1.8	6.08		20	
Selenium	1.5	1.3	ND			20	R

S2008131-008AD (08/25/20 16:13)	RunNo: 181916	PrepDate: 08/20/20 7:45	BatchID 17637				
Analyte	Result	RL	Ref Samp	%RPD	%REC	% RPD Limits	Qual
Boron	36	5	34	4.95		20	
Lithium	12.9	0.2	12.4	3.79		20	
Selenium	ND	1.3	ND			20	

- Qualifiers:**
- B Analyte detected in the associated Method Blank
 - E Value above quantitation range
 - H Holding times for preparation or analysis exceeded
 - L Analyzed by another laboratory
 - O Outside the Range of Dilutions
 - S Spike Recovery outside accepted recovery limits

- D Report limit raised due to dilution
- G Analyzed at IML Gillette laboratory
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- X Matrix Effect

Appendix C

Groundwater Flow Rate Calculations

Lewis & Clark Station CCR Unit Groundwater Velocity Calculation

Sampling Date 4/24/2023

Upgradient (MW103)

Top of Casing Elevation	1927.33	ft amsl
Depth to Water	10.39	ft below TOC
Water Level Elevation	1916.94	ft amsl

Groundwater Monitoring System Documentation (Barr, 2018)

Downgradient (MW117)

Top of Casing Elevation	1920.34	ft amsl
Depth to Water	5.00	ft below TOC
Water Level Elevation	1915.34	ft amsl

Groundwater Monitoring System Documentation (Barr, 2018)

horizontal hydraulic conductivity (Kh)	0.001	cm/s
	2.8	ft/day
porosity (n)	0.3	
horizontal distance	645	ft
WL elevation difference	1.60	ft
gradient (i)	0.002	ft/ft
horizontal linear velocity (V)	0.0234	ft/day
horizontal V	9	ft/yr

Placement Above the Uppermost Aquifer Determination (Barr, 2018)