Groundwater Monitoring & Corrective Action Report

Ash Pond - Dave Johnston Power Plant
Glenrock, Wyoming
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ATTACHMENTS

ACRONYMS

AMSL	Above Mean Sea Level
bgs	Below Ground Surface
CCR	Coal Combustion Residuals
COC	Chain of Custody
CFR	U.S. Code of Federal Regulations
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
FGD	Flue-Gas Desulfurization
ICP	Inductively Coupled Plasma
MCL	Maximum Concentration Limit
MDL	Method Detection Limit
MS	Mass Spectrometer
ORP	Oxidation-Reduction Potential
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SC	Specific Conductance
SM	Standard Methods
SOP	Standard Operation Procedure
SWFPR	Site-Wide False Positive Rate
UTL	Upper Tolerance Limit

1.0 INTRODUCTION

The Dave Johnston Power Plant is located 6.6 miles southeast of Glenrock, Wyoming. The physical location is Township 33 North, Range 74 West in Converse County. Dave Johnston is a four-unit coal-fired electrical generation plant owned by PacifiCorp. Bottom ash is slurried to the Ash Pond and spent flue gas de-sulfurization (FGD) scrubber fluids are transported there during upset conditions at the plant. As a result, the Ash Pond is considered a coal combustion residual (CCR) unit (Figure 1).

This Groundwater Monitoring and Corrective Action Report was prepared for PacifiCorp by Water and Environmental Technologies. It was prepared to comply with the requirements detailed in *Code of Federal Regulations* § 257.90(e) (*Final Rule*). Detection monitoring was initiated in September of 2015 to ensure a minimum of eight independent measurements were acquired, prior to the October 17, 2017 requirement in the *Final Rule*. PacifiCorp met this requirement and provided the findings of initial detection monitoring in the first Groundwater Monitoring and Corrective Action Report for the Ash Pond (WET 2018).

The results of detection monitoring found that Appendix III constituents: calcium, chloride, fluoride, pH and sulfate exceeded site-specific background concentrations. Based on these findings, the Ash Pond monitoring program transitioned to assessment monitoring in 2018. Two rounds of sampling were completed, groundwater protection standards were established for the Ash Pond, and assessment monitoring results were compared to these standards. These comparisons revealed Appendix IV constituents: arsenic, cadmium, molybdenum and radium exceeded the groundwater protection standards (Attachment B). As a result, an investigation was initiated to bound the nature and extent of the release. The Ash Pond will proceed to corrective measures in 2019 (Section 8.0).

This report provides the results of two rounds of assessment monitoring, and comparisons of downgradient results to groundwater protection standards. Results from the nature and extent investigation will be used to develop corrective measures at the Dave Johnston Power Plant and will be incorporated into the Corrective Measures Study for the Ash Pond and the Annual Groundwater Monitoring and Corrective Action Report for 2019.

1.1 Report Purpose and Organization

The following sections provide a status update for activities initiated or completed at the Dave Johnston Power Plant Ash Pond, for the 2018 monitoring period. They also summarize any issues or problems encountered, and their resolutions. Each required element of the annual report is displayed below and is referenced to specific sections of the report where the required information can be found:

- Document the status of the Groundwater Monitoring and Corrective Action Program (Sections 1, 5, 6, 7 and 8);
- Summarize key actions completed (Section 1);
- Describe any problems encountered (Section 1.2);

- Discuss actions taken to resolve problems (Section 1.2); and
- Define key activities for the upcoming year (Section 8).

The Annual Groundwater Monitoring and Corrective Action Report also includes the following required elements:

- A map showing the CCR unit and all CCR Monitoring Program background (or upgradient) and downgradient monitoring wells, and their identification numbers (Figure 1).
- Identifies any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken (Section 3.1.3).
- A summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required for detection or assessment monitoring (Section 5 and Table 5).
- A narrative discussion of any transition between monitoring programs (i.e. transitioning from detection monitoring to assessment monitoring) - Section 1.0 and 7.0, in addition to identifying constituents detected at a statistically significant increase over background levels (Section 6.0).

Other information required under § 257.90 through § 257.98 of the *Final Rule* can be found in the report as follows:

- § 257.91: Installed the detection monitoring network as required (Section 3)
- § 257.92: Reserved (no requirements)
- § 257.93: Developed a site-specific sampling and analysis requirements (Section 4.0)
- § 257.94: Completed detection monitoring as required (Section 5.0)
- § 257.95: Completed assessment monitoring and initiated investigation of the nature & extent of the release (Section 7.0)
- § 257.96: Initiated an assessment of corrective measures

1.2 Problems & Resolutions

No problems or issues were noted during the 2018 monitoring period.

2.0 HYDROGEOLOGIC SETTING

Based on past hydrogeologic studies and updates at the Dave Johnston Power Plant, along with specific hydrologic investigations in multiple areas across the facility, an interpretation of surface/subsurface geology is presented below. This interpretation incorporates information gathered during the installation of the monitoring network required by the State of Wyoming which currently includes 33 monitoring wells. An additional 10 new wells were installed for CCR monitoring. Geologic, groundwater and statistical information was supplemented by

monitoring and related data, gathered over the course of nearly 20 years of groundwater monitoring at the Dave Johnston Power Plant, as mandated by the State of Wyoming.

2.1 Stratigraphy and Lithology

Due to uplift of the mountains to the west and increased precipitation, the North Platte River was a degrading stream during the early and middle Pleistocene (Rapp, 1953). This activity scoured into the Lance shale and left behind classic fining upward alluvial sequences. These sequences include channel deposits, abandoned channels, floodplain deposits and oxbow lakes.

The alluvial units are underlain by the upper Cretaceous Lance Formation. The Lance is composed of shale and sandstone in the study area. The top several feet of the Lance has weathered into a clay or silt material. The irregular topography of the Lance has been formed by the interaction of erosional activity of the North Platte River and the variability in consolidation in the Lance Formation. The geometry of floodplain and meander channel deposits are key to understanding groundwater flow at this site. The more permeable channel material transports the majority of groundwater across the site.

The surface topography of the bedrock was modified by the various erosional and depositional stages of the North Platte River. On top of the bedrock, the river has deposited a classic alluvial sequence of upward fining sediments (Qal-np on Figure 2). The degree of sorting within the alluvial deposit is dependent on the stage of the river. During the early Pleistocene, deposition occurred under high-energy conditions resulting in a poorly sorted deposit. Lower energy meandering of the river during the middle to late Pleistocene resulted in a deposit that is well sorted with visible contacts between depositional sequences. During previous investigations (Atlatl, 1996), continuous core sampling provided detailed descriptions and locations of the deposits and allowed a much better understanding of the geologic controls on the site hydrogeology.

Aeolian deposits (Qal-a on Figure 2) are common on the surface along the northern site border. However, the windblown sand, characterized by frosted sand grains, has been reworked and deposited in an alluvial (well sorted) sand sequence. In addition, Sand Creek has formed an alluvial deposit (Qal-sc on Figure 2) which dissects the site from north to south and forms a subsurface channel of outwash sand and gravel. Well logs and water chemistry data, indicate the Sand Creek channel overlays the Lance shale at the Dave Johnston Plant. Well logs for the monitoring network are included in the site-specific sampling analysis plan for the Ash Pond, which is part of the facility operating record.

2.2 Groundwater

Site hydrogeology is complex, due mainly to the variable erosional bedrock topography at the site. While groundwater flow direction and gradient fluctuate, in general, the flow direction follows the topography of the bedrock, much the same as surface water. Groundwater enters the site from the meander of the North Platte River above the dam, from the foothills north of the

property, and from infiltration along Sand Creek. Bedrock topography causes groundwater to flow along a paleochannel to the southeast.

2.3 Aquifer Characteristics

The alluvial aquifer is unconfined to semi-confined and underlain by the less permeable Lance shale (Table 1). Near the Ash Pond, it varies in thickness from 18 feet to greater than 47 feet and the subsurface depth to water varies from 10 feet to 20 feet below ground surface (bgs). Recent slug testing indicates the hydraulic conductivity of the alluvium ranges from approximately 1.5 to 11 feet/day with a geometric mean conductivity of 3.1 feet/day. Per Morris and Johnson, 1967 (in Kresic N. 2007) data on properties of rock and soil, site-specific aquifer porosity and effective porosity are 37% and 27%, respectively.

Table 1. Dave Johnston Power Plant - Monitoring Network Slug Test Results

	DJ-2	DJ-12R	DJ-33
Calculated Hydraulic Conductivity	5.5E-04	4.0E-03	4.4E-04
		3.9E-03	6.7E-04
	5.1E-04	3.7E-03	
# of Measurements:	2	3	2
Mean Conductivity (cm/sec):	5.4E-04	3.9E-03	6.4E-04
Mean Conductivity (ft/day):	1.5	11	1.8
Slug testing was conducted on a facility-wide subset of wells to characterize site-wide hydrogeologic characteristics. Not all of the slug test wells appear on every site-specific map.			

The groundwater flow direction in the vicinity of the Ash Pond, is to the southeast with a hydraulic gradient of approximately to 3.5×10^{-4} to 5.1×10^{-3} feet/feet. The groundwater flow velocity is approximately 0.004 feet/day to 0.059 feet/day. A groundwater contour map for each sampling event is presented in the Field Summary Reports included as Attachments A and B.

3.0 GROUNDWATER MONITORING NETWORK

The following sections describe the monitoring network developed and implemented to support groundwater monitoring at the Dave Johnston Ash Pond. Eight independent measurements were acquired for all background and downgradient wells as of September 2016. Evaluation of the adequateness of the dataset and selection of the appropriate statistical method was completed by October 17, 2017.

3.1 Monitoring Network Installation

The Ash Pond is an approximately 25-acre impoundment (Figure 1). Ten additional monitoring wells were installed around the perimeter, in addition to the three existing wells that were part of the monitoring required by the State of Wyoming. The monitoring data collected from these wells includes groundwater elevations and water chemistry data, as required in Appendices III and IV of the CCR *Final Rule*. Two wells (DJ-41 and DJ-42) were installed on the dike between Ponds 4A and 4B, to serve as downgradient and upgradient wells for their respective ponds. However, water levels in monitoring well DJ-42 were within 5 feet of the top surface of the dike. This water level indicates direct hydrogeologic and hydraulic communication between the two ponds. Water quality data also indicated connection between the ponds and thus differentiation of seepage between ponds or identification of specific pond leakage is not possible. Thus, the ponds are considered one CCR unit.

3.1.1 Background Wells

Background monitoring wells include four locations spanning the extent of the Ash Pond east to west, and include: DJ-2, DJ-3, DJ-37, and DJ-38. The background well spacing and distribution were developed to comply with the requirements of the *Final Rule* and are contained in the plant operating record. Monitoring results from these locations indicate they are not being influenced by groundwater passing waste in the CCR unit, providing results representative of background concentrations for the site. Assessment monitoring results are provided in Section 5.0 and Table 5.

3.1.2 Downgradient Wells

Downgradient monitoring wells for the Ash Pond include six locations, placed to capture groundwater as it passes the boundary of the CCR unit. Using historical data and knowledge of the site from ongoing state mandated groundwater monitoring, downgradient wells were placed along the groundwater flow path which generally travels from north-northwest to the southeast as it passes across the Ash Pond (Attachments A & B). The spacing and distribution of the downgradient monitoring wells were developed to comply with the requirements of the *Final Rule* and are contained in the plant operating record. The downgradient wells include the following: DJ-12R, DJ-33, DJ-34, DJ-35, DJ-36, and DJ-40.

Table 2 provides a summary of well depths, and well construction details for the monitoring network. Well logs for each are included in the site-specific sampling and analysis plan for the Ash Pond, which is part of the facility operating record (WET 2017).

Table 2. Monitoring Well Information

Well Id#:	Latitude Degrees North:	Longitude Degrees West:	Top of Casing Elevation (feet AMSL)	Screened Interval (feet bgs)	Total Depth (feet)
DJ-2	42.841895	-105.78267	4970.84	32-47	47
DJ-3	42.844515	-105.78037	4970.10	30-45	45
DJ-12R	42.84314	-105.7762	4963.88	19-29	29
DJ-33	42.843771	-105.78062	4965.77	26-36	36
DJ-34	42.84284	-105.7799	4964.77	28-38	38
DJ-37	42.84589	-105.7747	4964.50	9-19	19
DJ-38	42.84598	-105.7772	4965.93	9-19	19
DJ-35	42.84283	-105.777	4961.98	15-25	25
DJ-36	42.84539	-105.7745	4965.26	19-29	29
DJ-40	42.84387	-105.7745	4966.56	18-28	28

3.1.3 Well Decommissioning / Replacement

Initially, monitoring wells DJ-41 and DJ-42 were installed in the dike, that divided what were considered separate waste management units, Ponds 4A and 4B. They were placed with the intent of providing downgradient water quality for Ash Pond 4A, and upgradient water quality for 4B. Both wells were damaged in 2016, as part of site maintenance activities. Prior to this, initial water levels and environmental sampling had begun. A review of water level data for monitoring well DJ-42, showed levels were within 5 feet of the top surface of the dike indicating direct hydrogeologic and hydraulic communication between the two ponds. Water quality data also supported this conclusion. Because DJ-41 and DJ-42 were no longer required in the monitoring network, they were abandoned in accordance with the requirements of the State of Wyoming.

Monitoring well DJ-12 was also installed as part of the monitoring network for the annual reports for the State of Wyoming. However, it was damaged prior to the initiation of sampling to support CCR monitoring. A replacement well (DJ-12R) was installed adjacent to DJ-12 in 2015. Only results from DJ-12R were included in this monitoring evaluation. Monitoring well DJ-12 was abandoned in accordance with the requirements of the State of Wyoming.

3.1.4 Monitoring Network Adequacy

The minimum requirement for a groundwater monitoring network under the *Final Rule* is consistent with other elements of the Resource Conservation and Recovery Act (RCRA), which mandates a minimum of one upgradient and three downgradient monitoring wells for each CCR unit. The *Final Rule* goes further, stating that justification is required if the minimum number of wells is selected as the monitoring network.

As Section 3.1 demonstrates, the groundwater monitoring network for the Ash Pond, surpasses the minimum requirements, employing four background and six downgradient wells. Their spatial distribution spans the geographic extent of the Ash Pond, along both the upgradient and downgradient boundaries of the CCR unit. The number and distribution of the wells provides a sufficient number of wells to capture groundwater as it passes the waste unit boundary in all directions along the groundwater flow path (Attachments A & B). Coupled with site-specific aquifer testing, the network also provides an adequate measure of the upper aquifer characteristics.

As Section 2.3 describes, the upper aquifer at the Ash Pond is defined by alluvial deposits which overlay the Lance Formation (shale). This deposit is 18 to 47 feet thick near the pond and comprises the unconfined upper aquifer at this site.

The monitoring network wells for the Ash Pond
were installed using appropriate spacing, location and depth as defined by the Code of Federal Regulations, 40 CFR, Part 257 and 261, *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule* § 257.91 (a) (1) and § 257.91 (b) and adequately monitor groundwater both hydraulically upgradient and downgradient of the site. The network is designed to sample the quality of groundwater passing the waste boundary of the CCR unit in accordance with § 257.91 (a) (2). The network exceeds the minimum monitoring requirements of one upgradient and three downgradient wells as defined in § 257.91 (c) (1), employing four upgradient and six downgradient monitoring wells. All 10 wells are completed in the uppermost aquifer as required by § 257.91 (a) and were constructed and are maintained in compliance with § 257.91 (e).

Groundwater elevations were measured in each well immediately prior to purging, each time groundwater was sampled. Groundwater elevations for the Ash Pond were measured during a short enough period (same field visit), to avoid temporal variations in groundwater flow that could preclude accurate determination of groundwater flow rate and direction. Attachments A & B provide representations of water level data acquired during assessment monitoring (groundwater contour maps).

4.0 SAMPLING AND ANALYSIS REQUIREMENTS

A site-specific sampling and analysis plan (SAP) was developed and implemented for the Ash Pond to support monitoring under the *Final Rule* (WET 2017). The SAP defines the procedures necessary to acquire data of known quality, from the upper aquifer. It includes provisions for all major elements of data collection and data evaluation, including those specified in the *Final Rule*:

- Water Levels & Well Purging
- Sample Collection & Preservation
- Sample Handling and Shipment / Delivery
- Chain of Custody
- Analytical Procedures

- Quality Assurance (QA) / Quality Control (QC)

4.1 Water Levels & Well Purging

Prior to initiating well purging activities, static water levels were acquired at each well, for each sampling event, using an electronic tape. The water levels were recorded in the field logbook at the time of collection. After returning from the field, water levels were reviewed, transferred to the data summary tables, and used to support an examination of groundwater flow direction and flow rates. Water levels were acquired in accordance with Environmental Protection Agency (EPA) Standard Operating Procedure (SOP) EPA-SOP-GW-001, *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (EPA 2010) and are summarized in Attachments A & B. Total depths for each well are summarized in Table 2 where were taken from the well logs in Appendix A of the site-specific SAP.

Well purging was completed in accordance with the SAP-specified standard investigation procedures (SIPs) and EPA-SOP-GW-001. During purging, field parameters were monitored, to evaluate groundwater equilibration. They were measured using a YSI Environmental 556 Multiprobe System (YSI 556 MPS) with pre-calibrated dissolved oxygen (DO), pH, specific conductance (SC), and oxidation-reduction potential (ORP) probes, and a Hach 2100Q Portable Turbidimeter and. Prior to sample collection, in-stream purge water was measured, by placing the multiprobe system into a pre-cleaned flow-through cell. The following field measurements were recorded on a groundwater sampling form. Once field parameters stabilized, groundwater samples were collected. Table 3 provides the stabilization criteria used for field parameters during well purging.

- Temperature: degrees Celsius
- SC: µS/cm
- DO: mg/L
- pH: standard units
- ORP: mV

Table 3. Field Parameter Stabilization Requirements

Parameter	Condition
Turbidity	1. 10% for values greater than 5 NTU 2. If three turbidity values are less than 5 NTU, the parameter is stabilized.
Dissolved Oxygen	1. 10% for values greater than 0.5 mg/L 2. If three dissolved oxygen values are less than 0.5, the parameter is stabilized.
Specific Conductance	3%
Temperature	3%

Parameter	Condition
pH	±0.1 unit
Oxidation/Reduction Potential	±10 millivolts

4.2 Sample Collection & Preservation

Groundwater samples were collected using a dedicated pump in each well. Dedicated pumps were installed and used throughout groundwater monitoring, to prevent cross-contamination and to provide consistent sampling. Samples were acquired in accordance with SIP No. 5, *Groundwater Sampling* (Appendix D - SAP). The basic steps for preparing and collecting groundwater samples included the following.

- Complete sample labels on each container by entering the following information:
  - Sample number
  - Sampler initials
  - Date and time of collection
  - Mark whether filtered or un-filtered
- Don new disposable sampling gloves.
- Fill provided containers for each well, by placing the tubing directly into the mouth of the container.
- Preserve the samples in accordance with Table 4.
- Seal the container.
- Place the container(s) into a cooler and maintain custody.

4.3 Sample Handling and Shipment / Delivery

Following the collection of a full sample container, samples were preserved, the container was sealed, placed in a plastic bag, and secured in a cooler packed with ice. Each cooler was secured, by affixing custody seals to lid and body of the cooler at the end of each day and prior to shipment or delivery. As needed, the seals were removed at the start of each day and discarded. Field personnel retained custody of the samples from the time of collection to delivery, or shipment to the analytical laboratory.

At the end of each sampling event, samples were either shipped using a national shipping vendor (e.g. Federal Express), or were hand delivered to the laboratory. When samples were shipped, labels were completed with the address of the contract laboratory, and hand delivered to the shipping company. The original air bill was retained as part of the field records, to ensure a complete custody history for the samples. To transfer custody, the date and time were recorded on the chain of custody (COC) form by the sampler, the COC was signed, the original retained, and the remaining copies affixed to the lid of the cooler. The cooler was then sealed, custody seals affixed, and the cooler was delivered for shipment or to the laboratory.

Table 4. Analytical Methods, Sample Preservation, and Holding Times

Analysis Request:	Analytical Method:	Preservation:	Holding Time:
Metals	EPA 200.7 / 200.8 EPA 245.1 (Hg)	Nitric Acid Cool 4ºC	180 days
Chloride	EPA 300.0	Cool 4ºC	28 days
Fluoride	SM 4500-F	Cool 4ºC	28 days
pH	EPA 150.1	Cool 4ºC	Immediately
Sulfate	EPA 300.0	Cool 4ºC	28 days
Total Dissolved Solids	SM 2540C	Cool 4ºC	7 days

4.4 Chain of Custody

A COC record supplied by the analytical laboratory was completed for all samples, as they were collected. The records included the following information:

- Project name and number
- Name of the analytical laboratory destination
- Sampler's signature
- Sample identification number, date and time of collection, filtered/unfiltered
- Number of containers and type of sample
- Analysis requested, and number of containers provided per analysis
- Any special instructions or hazard warnings

Upon relinquishing custody of the samples, both parties (sampler and lab) signed and dated the COC, noting the time of the exchange of custody. The sampler signed first relinquishing custody and the laboratory personnel signed next, taking custody. Intermediate signatures may or may not be present, depending on the duration of sampling and related factors. When accepting custody of the samples, laboratory personnel performed a review, comparing information on the sample bottles with the chain-of-custody entries. If an error was noted, the sampler was notified, and the issue was resolved prior to performing analyses. Samples marked preserved, were checked for proper pH adjustments, to ensure enough preservative was added and cooler temperatures were checked using a temperature blank, or by checking all of the samples. All samples were recorded in the laboratory receiving logbook and given a unique sample-tracking number prior to initiating analysis.

4.5 Analytical Procedures

Industry standard analytical methods were used to quantify the Appendix III constituents in each well, during each sampling event. Sample preparation and analysis included measurement of total recoverable metals on unfiltered samples in accordance with EPA Methods 3005A and 200.7 – Inductively Coupled Plasma (ICP) and/or 200.8 ICP – mass spectrometry (MS). Other

industry standard analytical methods were also employed for groundwater monitoring as outlined below:

- Chloride & Sulfate: EPA Method 300.0 – Ion Chromatography
- Fluoride: Standard Method 4500-F – Ion Selective Electrode
- pH: Standard Method A4500-H – Ion Selective Electrode
- Total Dissolved Solids (TDS): Standard Method 2540C – Gravimetric Method
- Metals: EPA 200.7 / 200.8 and EPA 245.1 (Hg)
- Ra^{226} & Ra^{228}: EPA 903.1 / EPA 904.0

4.6 Quality Assurance / Quality Control

The following sections define the quality control (QC) requirements specified for groundwater monitoring in the Ash Pond sampling and analysis plan.

4.6.1 Field Quality Control Requirements

Field quality control samples were required at a minimum frequency of one field blank and one field duplicate for every 20 field samples. In general, field quality control samples were collected during each sampling event, exceeding the basic requirements outlined in the SAP. They were submitted for analysis with the group of samples they were collected with, and underwent analysis for all Appendix III constituents (Table 4).

Field blanks were collected and analyzed to monitor the cleanliness of sample containers, preservatives, and the sampling and analytical process. Field duplicates provided a measure of precision among a group of samples, by providing a direct measurement of the variability between samples in each group. Field blanks were prepared using de-ionized water in randomly selected sample bottles. The blank was then preserved and handled in the same manner as the natural samples it accompanied. Field duplicates were collected using the same collection procedures as the original sample, by collecting a separate sample using the low-flow sampling procedure. The sample was collected immediately following collection of the original sample and preserved and handled in accordance with the SAP provisions. A summary of field quality control performance is provided in Section 5.3.

Note: Equipment rinsates or cross-contamination blanks, were not required for this sampling effort, as dedicated pumps and tubing were used throughout the groundwater monitoring process.

4.6.2 Laboratory Quality Control Requirements

Laboratory quality control for groundwater monitoring, consisted of analytical method-specific requirements. Laboratory quality control common to all of the analytical methods includes:

- Chain of Custody
- Sample Preservation

- Holding Times
- Method Calibrations
- Field & Method Blanks
- Laboratory Control Samples
- Duplicates
- Matrix Spikes

Each of these elements, as well as, method-specific QC requirements and corresponding field documentation, underwent a full review as part of data validation. A summary of laboratory quality control performance is provided in Section 5.1.

5.0 ASSESSMENT MONITORING RESULTS AND DISCUSSION

The Ash Pond was transitioned to assessment monitoring in 2018. Two rounds of sampling and analysis were completed, and these results were compared with groundwater protection standards. All of the samples underwent analysis in accordance with the requirements defined in the *Final Rule*. In addition, water level data was acquired each time the wells were sampled, in accordance with the SAP. Table 5 provides 2018 assessment monitoring data collected for the Ash Pond. A full examination of water quality is provided in Section 6.0. Attachments A and B contain groundwater contour maps, data validation, and the laboratory data packages for each event. Attachment B contains statistical analyses comparing downgradient groundwater values to groundwater protection standards.

5.1 Data Quality / Usability

All of the 2018 assessment monitoring results and results from the nature and extent investigation, underwent data validation in accordance with the EPA *National Functional Guidelines for Inorganic Data Review* (EPA 2017). The complete results are included in Attachments A & B.

None of the analytical data used to assess groundwater quality for the Ash Pond were rejected due to quality control issues. A number of results were qualified either J, J+, or UJ, due to positive detections in the laboratory method blank(s) or field blank. These qualifiers indicate reported results are estimated. Although qualified, these results meet the usability criteria for evaluating site conditions and decision making (EPA 1989).

Several sample values were qualified either J+ or J-, due to matrix spike recoveries outside of the prescribed control limits. These qualifiers indicate the reported concentrations are likely overestimates (J+) or underestimates (J-), due to bias experienced during analysis from the sample matrix. Like results qualified due to blank performance, results qualified due to matrix spike difficulties, are usable to evaluate groundwater quality for the Ash Pond.

Table 5. Dave Johnston Power Plant - Ash Pond Assessment Monitoring Results

Appendix III

SAMPLE ID	WELL TYPE	COLLECTION DATE	TOC AMSL (ft)	DTW (ft)	GWE AMSL (ft)	B		Ca		Cl		F		pH		SO_4		TDS	
						mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	s.u	Q	mg/L	Q	mg/L	Q
DJ-2	Background	9/28/2015	4970.84	23.70	4947.14	0.15	J+	37	J+	21		0.2	J+	8.09		143		493	
		11/16/2015		24.15	4946.69	0.11		40		22		0.2	J+	8.00		165		515	
		12/10/2015		24.22	4946.62	0.10		43		9		0.2	J+	7.95		70		526	
		1/7/2016		24.13	4946.71	0.14	J	43		23		0.2	J+	7.99		178		527	
		2/9/2016		23.92	4946.92	0.12		48		23		0.2		8.06		173		518	
		3/2/2016		24.17	4946.67	0.10	UJ	49		24		0.2		7.97		186		527	
		4/13/2016		24.18	4946.66	0.11		43		23		0.2		8.08		178		526	
		5/10/2016		23.49	4947.35	0.11		42		23		0.2		7.98		178		529	
		6/15/2016		23.40	4947.44	0.11		33		21		0.2		8.05		146		490	
		9/21/2016		25.32	4945.52	0.12		34	J+	22		0.3		7.98		148		475	
		2/14/2018		24.31	4946.53	NS													
		5/23/2018		23.61	4947.23	0.13		41		23		0.2	J-	8.02		163	J-	521	
DJ-3	Background	9/28/2015	4970.10	20.88	4949.22	0.11		160		10		<0.1		7.78		34		295	
		11/16/2015		21.10	4949.00	0.07		56		12		<0.1		7.69		34		282	
		12/10/2015		21.15	4948.95	0.06		55		11		<0.1		7.66		34		281	
		1/7/2016		21.33	4948.77	0.09	J	71		10		<0.1		7.76		34		288	
		3/2/2016		21.09	4949.01	0.07	J-	55		9		<0.1		7.75		34		291	
		4/13/2016		21.13	4948.97	0.08		67		9		<0.1		7.75		33		291	
		5/10/2016		22.80	4947.30	0.07	J+	57		<1		<0.1		7.71		34		280	
		6/15/2016		20.95	4949.15	0.07		53		12		<0.1		7.74		33		294	
		9/21/2016		22.63	4947.47	0.06		59	J+	14		<0.1		7.69		37		290	
		2/14/2018		20.24	4949.86	NS													
		5/23/2018		20.35	4949.75	0.08		58		14		<0.1	UJ	7.69		37	J-	305	
DJ-37	Background	9/27/2015	4964.50	NM	NM	NS - Not enough water to sample.													
		11/16/2015		17.17	4947.33	5.78		532		93		0.6		7.07		1640		2890	
		12/10/2015		17.12	4947.38	4.65		431		79		0.6		7.16		1400		2310	
		1/7/2016		17.24	4947.26	3.89	J	341		64		0.8		7.25		1120		2030	
		2/10/2016		17.34	4947.16	3.68		387		62		0.8		7.23		1060		1950	
		3/2/2016		17.44	4947.06	3.24	J-	358		60		0.8		7.21		1010		1790	
		4/13/2016		17.48	4947.02	3.46	J+	346		62		0.8		7.27		1040		1920	
		5/10/2016		16.95	4947.55	3.82		408		70		0.7		7.24		1130		2180	
		6/15/2016		17.35	4947.15	5.30		578		102		0.5		7.18		1630		3030	
		9/21/2016		18.73	4945.77	NS - Not enough water to sample.													
		2/14/2018		17.04	4947.46	NS													
		5/23/2018		17.42	4947.08	4.41		464		56		0.6	J-	7.36		1330	J-	2420	
DJ-38	Background	9/27/2015	4965.93	10.30	4955.63	0.26	J+	190	J+	57		0.8	J+	7.61		819		1720	
		11/15/2015		11.92	4954.01	0.14		181		55		0.3	J+	7.52		759		1610	
		12/10/2015		12.86	4953.07	0.13		182		59		0.3	J+	7.54		794		1630	
		3/2/2016		13.54	4952.39	0.15	J-	198		60		0.2		7.46		851		1740	
		4/13/2016		13.78	4952.15	0.13		216		60		0.2		7.41		902		1880	
		5/10/2016		10.99	4954.94	0.12		178		53		0.3		7.54		742		1580	
		6/15/2016		10.05	4955.88	0.32		185		55		0.8		7.60		804		1640	
		9/21/2016		9.90	4956.03	0.23		157		60		0.8		7.53		860		1710	
		2/14/2018		10.07	4955.86	NS													
		5/23/2018		10.82	4955.11	0.24		176		58		0.8	J-	7.55		765	J-	1580	
DJ-12R	Downgradient	9/28/2015	4964.06	17.08	4946.98	1.90	J+	53	J+	43		2.1	J+	11.00		289		751	
		11/16/2015		17.17	4946.89	1.75		141		35		1.3		8.50		631		1240	
		12/10/2015		17.23	4946.83	1.67		72		41		1.6		10.30		352		822	
		1/7/2016		17.19	4946.87	1.59	J	61		44		1.7		11.10		307		883	
		2/10/2016		16.96	4947.10	1.82		94		56		1.4		9.85		510		1060	
		3/2/2016		17.06	4947.00	1.64	J-	98		38		1.2		9.28		481		907	
		4/13/2016		17.00	4947.06	1.45		131		28		1.4		8.76		491		926	
		5/10/2016		17.06	4947.00	1.28		114		26		1.2		8.79		442		848	
		6/15/2016		17.98	4946.08	1.47		163		28		1.1		7.97		585		1070	
		9/21/2016		18.72	4945.34	1.31		82	J+	55		2.4		10.00		438		1010	
		2/14/2018		16.94	4947.12	NS													
		5/23/2018		16.80	4947.26	1.28		70		24		1.0	J-	11.20		361		773	

Appendix IV

SAMPLE ID	COLLECTION DATE	Sb		As		Ba		Be		Cd		Cr		Co		Pb		Li		Hg		Mo		Se		Tl		Radium 226+228	
		mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	pCi/L	Q
DJ-2	9/28/2015	<0.001		<0.001	UJ	0.07		<0.001		<0.001		<0.005		<0.005		0.002		<0.1		<0.0001		0.002		<0.001		<0.0005		2.90	
DJ-2	11/16/2015	<0.001		<0.001		0.06	J-	<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.001		<0.001		<0.0005		0.60	U
DJ-2	12/10/2015	<0.001		0.002		0.08		<0.001		<0.001		<0.005		<0.005		0.002		<0.1		<0.0001		0.002	J+	<0.001		<0.0005		3.49	
DJ-2	1/7/2016	<0.001	UJ	<0.001		0.07		<0.001	UJ	<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.002		<0.001		<0.0005		0.70	U
DJ-2	2/9/2016	<0.001		<0.001		0.07		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.001		<0.001		<0.0005		1.30	U
DJ-2	3/2/2016	<0.001		0.001	J+	0.09		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		<0.001		<0.001		<0.0005		2.30	U
DJ-2	4/13/2016	<0.001		<0.001		0.09		<0.001		<0.001		<0.005		<0.005		0.002	J+	<0.1		<0.0001		0.002	J+	<0.001		<0.0005		4.20	
DJ-2	5/10/2016	<0.001		<0.001		0.07		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		<0.001	UJ	<0.001		<0.0005		2.20	
DJ-2	6/15/2016	<0.001		<0.001		0.06		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.001	J+	<0.001		<0.0005		2.40	
DJ-2	9/21/2016	<0.001		<0.001		0.06		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.002	J+	<0.001		<0.0005		NA	
DJ-2	2/14/2018	<0.001		<0.001		0.06		<0.001		<0.001		<0.001		<0.005		<0.001		<0.1		<0.0001		0.001		<0.001		<0.0005		1.3	
DJ-2	5/23/2018	<0.001		<0.001		0.09		<0.001		<0.001		0.002	J+	<0.005		0.001	J+	<0.1		<0.0001		0.001		<0.001	J+	<0.0005		1.0	
DJ-3	9/28/2015	<0.001		0.012		1.2		0.004		<0.001		0.056		0.03		0.06		<0.1		<0.0001		0.002		0.001		<0.0005		8	
DJ-3	11/16/2015	<0.001		<0.001		0.12	J-	<0.001		<0.001		<0.005		<0.005		0.002		<0.1		<0.0001		0.002		<0.001		<0.0005		1.70	
DJ-3	12/10/2015	<0.001		<0.001		0.09		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.001	J+	0.001	J+	<0.0005		2.03	
DJ-3	1/7/2016	<0.001	UJ	0.002		0.25		<0.001	UJ	<0.001		0.009		<0.005		0.008		<0.1		<0.0001		0.001		0.001		<0.0005		3.60	
DJ-3	3/2/2016	<0.001		<0.001		0.09		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.001		<0.001		<0.0005		0.70	U
DJ-3	4/13/2016	<0.001		0.001	J+	0.24		<0.001		<0.001		0.008		<0.005		0.007		<0.1		<0.0001		<0.001		<0.001		<0.0005		3.20	
DJ-3	5/10/2016	<0.001		<0.001		0.16		<0.001		<0.001		<0.005		<0.005		0.003		<0.1		<0.0001		0.001	J+	<0.001		<0.0005		2.10	
DJ-3	6/15/2016	<0.001		<0.001		0.13		<0.001		<0.001		<0.005		<0.005		0.003		<0.1		<0.0001		0.001		<0.001		<0.0005		2.60	
DJ-3	9/21/2016	<0.001		<0.001		0.14		<0.001		<0.001		<0.005		<0.005		0.003		<0.1		<0.0001		0.001	J+	<0.001		<0.0005		0.50	U
DJ-3	2/14/2018	<0.001		<0.001		0.18		<0.001		<0.001		0.004		<0.005		0.005		<0.1		<0.0001		<0.001		<0.001		<0.0005		2.7	
DJ-3	5/23/2018	<0.001		<0.001		0.11		<0.001		<0.001		<0.001		<0.005		<0.001		<0.1		<0.0001		<0.001		<0.001		<0.0005		1.4	
DJ-37	9/27/2015	NS - Not enough water to sample.																											
DJ-37	11/16/2015	<0.001		<0.001		<0.05	UJ	<0.001		<0.001		<0.005		0.028		0.003		<0.1		<0.0001		0.013		0.001		<0.0005		1.30	
DJ-37	12/10/2015	<0.001		0.002		<0.05		<0.001		0.003		<0.005		0.096		0.009		<0.1		<0.0001		0.023	J+	<0.001		<0.0005		2.10	
DJ-37	1/7/2016	<0.001	UJ	0.001	J+	<0.05		<0.001	UJ	0.002		<0.005		0.118		0.009		<0.1		<0.0001		0.037		<0.001		<0.0005		2.70	
DJ-37	2/10/2016	<0.001		0.002		<0.05		<0.001		0.002		<0.005		0.091		0.008		<0.1		<0.0001		0.035		<0.001		<0.0005		2.90	
DJ-37	3/2/2016	<0.001		0.002	J+	0.07		<0.001		0.002		<0.005		0.102		0.010		<0.1		<0.0001		0.045		0.001		<0.0005		2.50	
DJ-37	4/13/2016	<0.001		<0.001		<0.05		<0.001		0.002		<0.005		0.075		0.006		<0.1		<0.0001		0.040	J+	<0.001		<0.0005		2.30	
DJ-37	5/10/2016	<0.001		<0.001		<0.05		<0.001		0.002	J+	<0.005		0.046		0.004		<0.1		<0.0001		0.037		<0.001		<0.0005		2.30	
DJ-37	6/15/2016	<0.001		<0.001		<0.05		<0.001		0.002		<0.005		0.010		<0.001		<0.1		<0.0001		0.010		<0.001		<0.0005		3.60	
DJ-37	9/21/2016	NS - Not enough water to sample.																											
DJ-37	2/14/2018	<0.001		<0.001		<0.05		<0.001		<0.001		<0.001		<0.005		<0.001		<0.1		<0.0001		0.007		<0.001		<0.0005		2.1	
DJ-37	5/23/2018	<0.001		<0.001		<0.05		<0.001		<0.001		<0.001		0.013		<0.001		<0.1		<0.0001		0.020		<0.001		<0.0005		1.0	
DJ-38	9/27/2015	<0.001		0.001	J-	<0.05		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.009		0.010		<0.0005		1.80	
DJ-38	11/15/2015	<0.001		<0.001		<0.05	UJ	<0.001		<0.001		<0.005		<0.005		0.001		<0.1		<0.0001		0.003		0.004		<0.0005		2.70	
DJ-38	12/10/2015	<0.001		0.002		0.09		<0.001		<0.001		<0.005		<0.005		0.004		<0.1		<0.0001		0.003	J+	0.006		<0.0005		1.45	U
DJ-38	3/2/2016	<0.001		0.002	J+	0.12		<0.001		<0.001		<0.005		<0.005		0.005		<0.1		<0.0001		0.004		0.005		<0.0005		2.00	
DJ-38	4/13/2016	<0.001		0.002	J+	0.19		<0.001		<0.001		0.009		<0.005		0.008		<0.1		<0.0001		0.003	J+	0.005	J+	<0.0005		4.40	
DJ-38	5/10/2016	<0.001		0.001		0.06		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.003	J+	0.005		<0.0005		2.90	
DJ-38	6/15/2016	<0.001		<0.001		0.06		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.007		0.007	J+	<0.0005		4.00	
DJ-38	9/21/2016	<0.001		<0.001		<0.05		<0.001		<0.001		<0.005		<0.005		<0.001		0.1		<0.0001		0.007	J+	0.008		<0.0005		0.04	U
DJ-38	2/14/2018	<0.001		<0.001		<0.05		<0.001		0.003		0.001		<0.005		<0.001		0.1		<0.0001		0.006		0.003		<0.0005		3.2	
DJ-38	5/23/2018	<0.001		<0.001		0.06		<0.001		<0.001		0.002	J+	<0.005		0.002		<0.1		<0.0001		0.005		0.003		<0.0005		1.8	
DJ-12R	9/28/2015	0.002		0.005	J-	0.05		<0.001		<0.001		<0.005		<0.005		0.001		<0.1		<0.0001		0.160		0.028		<0.0005		1.30	
DJ-12R	11/16/2015	<0.001		0.013		0.06	J-	<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.129		0.077		<0.0005		1.80	
DJ-12R	12/10/2015	<0.001		0.009		0.07		<0.001		<0.001		<0.005		<0.005		0.004		<0.1		<0.0001		0.191		0.054		<0.0005		1.43	
DJ-12R	1/7/2016	<0.001	UJ	0.008		0.06		<0.001	UJ	<0.001		<0.005		<0.005		0.002		<0.1		<0.0001		0.235		0.062		<0.0005		2.10	
DJ-12R	2/10/2016	<0.001		0.011		0.11		<0.001		<0.001		0.011		<0.005		0.006		<0.1		<0.0001		0.250		0.047		<0.0005		1.60	
DJ-12R	3/2/2016	<0.001		0.007		0.08		<0.001		<0.001		<0.005		<0.005		0.003		<0.1		<0.0001		0.156		0.029		<0.0005		0.60	U
DJ-12R	4/13/2016	<0.001		0.013		0.15		<0.001		<0.001		0.019		0.008		0.010		<0.1		<0.0001		0.079	J+	0.017		<0.0005		2.70	
DJ-12R	5/10/2016	<0.001		0.007		<0.05		<0.001		0.002	J+	<0.005		<0.005		<0.001		<0.1		<0.0001		0.067		0.020		0.0011		3.10	
DJ-12R	6/15/2016	0.001	J+	0.003		0.07		<0.001		0.002		<0.005		<0.005		<0.001		<0.1		<0.0001		0.053		0.017		<0.0005		3.20	
DJ-12R	9/21/2016	<0.001		0.021		<0.05		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.254		0.080		<0.0005		0.05	U
DJ-12R	2/14/2018	<0.001		0.007		<0.05		<0.001		<0.001		<0.001		<0.005		<0.001		<0.1		<0.0001		0.038		0.013		<0.0005		2.1	
DJ-12R	5/23/2018	<0.001		0.008		<0.05		<0.001		<0.001		<0.001		<0.005		<0.001		<0.1		<0.0001		0.056		0.007		<0.0005		1.4	

NS: Not Sampled
NM: Not Measured
GWE: Ground Water Elevation
DTW: Depth to Water
TOC: Top of Casing
AMSL: Above Mean Sea Level

Q: Data Validation Qualifier
J: Estimated
J+: Overestimated
UJ: Estimated Non-Detect
J-: Underestimated

Table 5. Dave Johnston Power Plant - Ash Pond Assessment Monitoring Results

						Appendix III														Appendix IV																							
SAMPLE ID	WELL TYPE	COLLECTION DATE	TOC AMSL (ft)	DTW (ft)	GWE AMSL (ft)	B		Ca		Cl		F		pH		SO_4		TDS		Sb		As		Ba		Be		Cd		Cr		Co		Pb		Li		Hg		Mo		Se		Tl		Radium 226+228	
						mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	s.u	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	pCi/L	Q
DJ-33	Downgradient	9/27/2015	4965.77	18.00	4947.77	NS - Not enough water to sample.																																					
		11/16/2015		18.62	4947.15	1.12		256		68		0.4		7.47		1190		2080		<0.001		0.005		0.14	J-	<0.001		<0.001		0.010		0.008		0.009		<0.1		<0.0001		0.113		0.008		<0.0005		1.40	
		12/10/2015		18.66	4947.11	1.14		262		65		0.4		7.49		1040		1920		<0.001		0.013		0.30		0.001		<0.001		0.030		0.016		0.022		<0.1		<0.0001		0.110		0.013		<0.0005		1.01	U
		1/7/2016		18.52	4947.25	0.92	J	290		64		0.4		7.59		1120		2080		<0.001	UJ	0.016		0.48		0.001	J	0.001		0.048		0.021		0.031		<0.1		<0.0001		0.104		0.014		<0.0005		2.30	
		2/10/2016		18.20	4947.57	1.36		331		74		0.4		7.51		1400		2420		<0.001		0.011		0.32		0.001		<0.001		0.033		0.015		0.022		<0.1		<0.0001		0.121		0.014		<0.0005		5.70	
		3/2/2016		18.26	4947.51	1.22		276		70		0.4		7.55		1280		2140		<0.001		0.007		0.19		<0.001		<0.001		0.016		0.011		0.011		<0.1		<0.0001		0.110		0.012		<0.0005		0.70	U
		4/13/2016		18.40	4947.37	1.21		346		63		0.4		7.58		1130		2090		<0.001		0.007	J+	0.21		<0.001		<0.001		0.021		0.012		0.013		<0.1		<0.0001		0.100		0.015		<0.0005		3.10	
		5/10/2016		18.06	4947.71	1.25		291		61		0.4		7.55		1100		2090		<0.001		0.009		0.26		0.001		<0.001		0.028		0.008		0.016		<0.1		<0.0001		0.118		0.014		<0.0005		3.90	
		6/15/2016		18.43	4947.34	1.40		354		68		0.4		7.55		1370		2400		<0.001	J+	0.01		0.31		<0.001		0.001		0.031		0.016		0.020		0.1		<0.0001		0.125		0.020		<0.0005		3.60	
		9/21/2016		20.52	4945.25	1.01		264		61		0.4		7.55		1180		2160		<0.001		0.003		<0.05		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.109		0.021		<0.0005		1.90	U
		2/14/2018		17.96	4947.81	NS														<0.001		0.001		<0.05		<0.001		<0.001		0.002		0.006		0.002		<0.1		<0.0001		0.133		0.014		<0.0005		2.5	
		5/23/2018		17.92	4947.85	1.54		207		48		0.5	J-	7.68		882	J-	1620		<0.001		0.003		0.10		<0.001		<0.001		0.008		0.009		0.006		<0.1		<0.0001		0.139		0.010		<0.0005		4.8	
DJ-34	Downgradient	9/27/2015	4964.77	17.37	4947.40	0.67	J+	120	J+	25		1.5	J+	7.84		631		1190		<0.001		0.002	J-	<0.05		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.056		<0.001		<0.0005		1.00	U
		11/15/2015		17.78	4946.99	0.84		165		48		1.3		7.94		698		1330		<0.001		0.001		<0.05	UJ	<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.053		<0.001		<0.0005		1.70	
		12/10/2015		17.88	4946.89	0.92		177		52		1.3		7.69		744		1370		<0.001		0.003		0.08		<0.001		<0.001		<0.005		<0.005		0.002		<0.1		<0.0001		0.048		<0.001		<0.0005		0.47	U
		1/7/2016		17.73	4947.04	0.95	J	211		55		1.1		7.71		813		1510		<0.001	UJ	0.002		0.10		<0.001	UJ	<0.001		<0.005		0.005		0.002		<0.1		<0.0001		0.049		<0.001		<0.0005		1.30	
		2/10/2016		17.43	4947.34	1.17		248		72		1.1		7.73		887		1690		<0.001		0.002		0.09		<0.001		<0.001		<0.005		0.007		0.002		<0.1		<0.0001		0.046		<0.001		<0.0005		3.80	
		3/2/2016		17.63	4947.14	1.20	J-	276		105		1.0		7.63		891		1720		<0.001		0.002	J+	0.09		<0.001		<0.001		<0.005		0.007		0.002		<0.1		<0.0001		0.048		0.001		<0.0005		0.60	U
		5/10/2016		17.28	4947.49	1.30		242		118		1.1		7.65		823		1660		<0.001		0.002		0.06		<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.058		<0.001		<0.0005		2.80	
		6/15/2016		17.55	4947.22	1.01		158		48		1.2		7.69		721		1310		<0.001	UJ	0.001		<0.05		<0.001		<0.001		<0.005		0.005		<0.001		<0.1		<0.0001		0.049		<0.001		<0.0005		2.30	
		9/21/2016		19.64	4945.13	0.83		117		21		1.1		7.67		521		982		<0.001		<0.001		<0.05		<0.001		<0.001		<0.005		0.008	J+	<0.001		<0.1		<0.0001		0.063		<0.001		<0.0005		1.90	
		2/14/2018		17.29	4947.48	NS														<0.001		<0.001		0.06		<0.001		<0.001		<0.001		0.013		<0.001		<0.1		<0.0001		0.062		<0.001		<0.0005		4.0	
		5/23/2018		17.22	4947.55	1.58		118		28		1.4		7.69		407		786		<0.001		<0.001		<0.05		<0.001		<0.001		<0.001		0.008		<0.001		<0.1		<0.0001		0.050		<0.001		<0.0005		2.0	
DJ-35	Downgradient	9/28/2015	4962.33	15.78	4946.55	2.70	J+	200	J+	29		2.2	J+	7.47		984		1780		<0.001		0.003	J-	0.06		<0.001		<0.001		0.006		0.009		0.003		<0.1		<0.0001		0.061		0.017		<0.0005		1.50	
		11/16/2015		15.90	4946.43	2.94		179		27		2.2		7.40		872		1660		<0.001		0.002		<0.05	UJ	<0.001		<0.001		<0.005		0.006		<0.001		<0.1		<0.0001		0.067		0.006		<0.0005		1.40	
		12/10/2015		15.93	4946.40	2.96		175		30		2.3		7.42		894		1590		<0.001		0.004		0.05		<0.001		<0.001		<0.005		0.009		0.002		<0.1		<0.0001		0.080		0.007		<0.0005		0.73	
		1/7/2016		15.87	4946.46	2.94	J	166		28		2.5		7.51		846		1550		<0.001	UJ	0.006		0.13		<0.001	UJ	<0.001		0.014		0.012		0.008		<0.1		<0.0001		0.076		0.005		<0.0005		2.30	
		2/10/2016		15.60	4946.73	3.14		201		28		2.2		7.47		894		1690		<0.001		0.006		0.14		<0.001		<0.001		0.014		0.010		0.008		<0.1		<0.0001		0.064		0.004		<0.0005		2.80	
		3/2/2016		15.71	4946.62	3.06		231		29		2.1		7.49		937		1670		<0.001		0.006		0.17		<0.001		<0.001		0.018		0.009		0.011		<0.1		<0.0001		0.068		0.003		<0.0005		3.30	
		4/13/2016		15.70	4946.63	2.84		196		32		2.1		7.49		919		1680		<0.001		0.005	J+	0.12		<0.001		<0.001		0.014		0.012		0.008		<0.1		<0.0001		0.060	J+	0.005	J+	<0.0005		3.50	
		5/10/2016		15.53	4946.80	2.73		210		34		1.8		7.49		915		1720		<0.001		0.003		<0.05		<0.001		<0.001	UJ	<0.005		0.006		0.002		<0.1		<0.0001		0.066		0.006		<0.0005		2.10	
		6/15/2016		16.22	4946.11	2.60		151		46		2.4		7.61		782		1440		<0.001		0.004		<0.05		<0.001		<0.001		<0.005		0.007		<0.001		<0.1		<0.0001		0.098		0.002		<0.0005		3.30	
		9/21/2016		17.22	4945.11	2.09		123		51		2.3		7.57		797		1420		<0.001		0.005		<0.05		<0.001		<0.001		<0.005		0.006		<0.001		<0.1		<0.0001		0.099		<0.001		<0.0005		5.60	
		2/14/2018		15.54	4946.79	NS														<0.001		0.010		<0.05		<0.001		0.002		<0.001		0.045		0.002		<0.1		<0.0001		0.102		<0.001		<0.0005		0.5	
		5/23/2018		15.23	4947.10	2.71		65		25		2.5	J-	8.99		537	UJ	1060		<0.001		0.014		<0.05		<0.001		0.001		<0.001		0.039		0.001	J+	<0.1		<0.0001		0.097		<0.001		<0.0005		2.5	
DJ-36	Downgradient	9/26/2015	4965.26	17.38	4947.88	1.20	J+	170	J+	38		1.3	J+	7.78		514		945		<0.001		0.031	J-	1.00		0.004		0.007		0.097		0.074		0.065		<0.1		0.0003		0.025		0.003		0.0013		4.00	
		11/15/2015		16.90	4948.36	1.33		129		36		1.2		7.79		478		881		<0.001		0.003		0.09	J-	<0.001		0.005		0.008		0.034		0.006		<0.1		<0.0001		0.032		<0.001		<0.0005		2.30	
		12/10/2015		16.47	4948.79	3.15		378		26		0.6		7.29		1240		2060		<0.001		0.014		0.34		0.002		0.002		0.03		0.018		0.023		<0.1		<0.0001		0.029	J+	0.001	J+	<0.0005		6.80	
		1/7/2016		16.01	4949.25	4.72	J	588		30		0.5		7.27		1660		2900		<0.001	UJ	0.009		0.23		<0.001	UJ	<0.001		0.024		0.008		0.013		<0.1		<0.0001		0.034		0.010		<0.0005		1.90	
		2/10/2016		16.43	4948.83	4.13		524		27		0.6		7.48		1520		2640		<0.001		0.012		0.31		0.002		0.001		0.032		0.011		0.024		<0.1		<0.0001		0.034		0.002		<0.0005		5.80	
		3/2/2016		16.69	4948.57	4.05		491		27		0.5		7.31		1540		2460		<0.001		0.016		0.36		0.003		0.002		0.05		0.014		0.028		<0.1		<0.0001		0.034		0.002		0.0006		1.90	U
		4/13/2016		16.50	4948.76	3.31		434		23		0.6		7.43		1260		2220		<0.001		0.016		0.43		0.003		0.002	J+	0.06		0.023		0.037		<0.1		<0.0001		0.026	J+	0.002	J+	0.0007	J+	4.00	
		5/10/2016		16.49	4948.77	3.00		445		22		0.6		7.41		1320		2340		<0.001		0.006		0.20		0.001		<0.001		0.06		0.006		0.016		<0.1		<0.0001		0.046		0.001		<0.0005		5.60	
		6/15/2016		17.91	4947.35	2.94		428		26		0.6		7.46		1320		2240		<0.001		0.003		0.11		<0.001		<0.001		0.012		0.006		0.007		<0.1		<0.0001		0.047		<0.001		<0.0005		5.20	
		9/21/2016		19.60	4945.66	1.46		236		30		0.8		7.49		899		1480		<0.001		0.011		0.34		0.001		0.001	J+	0.039	J+	0.016	J+	0.022		<0.1		<0.0001		0.074		0.002		<0.0005		1.90	
		2/14/2018		17.16	4948.10	NS														<0.001		0.004		0.16		<0.001		0.013		0.010		0.096		0.010		<0.1		<0.0001		0.042		<0.001		<0.0005		7.7	
		5/23/2018		17.52	4947.74	1.4		140		29		1.4	J-	7.82		555	J-	1040		<0.001		0.006		0.18		<0.001		0.011		0.016		0.080		0.015		<0.1		<0.0001		0.034		<0.001		<0.0005		6.0	
DJ-40	Downgradient	9/26/2015	4966.81	20.19	4946.62	3.00	J+	210	J+	22		1.4	J+	7.57		696		1290		<0.001		0.002	J-	<0.05		<0.001		<0.001		<0.005		<0.005		0.001		<0.1		<0.0001		0.040		0.018		<0.0005		0.80	U
		11/16/2015		20.37	4946.44	4.03	J+	328	J+	23		1.1		7.46		940		1760		<0.001		<0.001		<0.05	UJ	<0.001		<0.001		<0.005		<0.005		<0.001		<0.1		<0.0001		0.031		0.050		<0.0005		2.40	
		12/10/2015		20.47	4946.34	3.98		267		22		0.9		7.39		785		1420		<0.001		0.003		0.08		<0.001		<0.001		0.008		<0.005		0.005		<0.1		<0.0001		0.024	J+	0.036		<0.0005		2.54	
		1/7/2016		20.39	4946.42	3.36	J	198		22		1.0		7.53		618		1150		<0.001	UJ	0.001	J+	<0.05		<0.001	UJ	<0.001		<0.005		<0.005		0.001		<0.1		<0.0001		0.017		0.021		<0.0005		2.20	
		2/10/2016		20.33	4946.48	2.69		185		21		1.1		7.64		553		1020		<0.001		0.002		0.06		<0.001		<0.001		0.006		<0.005		0.003		<0.1		<0.0001		0.023		0.014		<0.0005		2.40	
		3/2/2016		20.44	4946.37	2.55		169		11		1.0		7.62		271		956		<0.001		0.002	J+	0.05		<0.001		<0.001		<0.005		<0.005		0.002		<0.1		<0.0001		0.032		0.012		<0.0005		0.50	U
		4/13/2016		20.33	4946.48	2.11		145		18		1.2		7.71		440		836		<0.001		0.002	J+	<0.05		<0.001		<0.001		<0.005		<0.005		0.002	J+	<0.1		<0.0001		0.038	J+	0.010		<0.0005		2.30	
		5/10/2016		20.38	4946.43	2.03		147		17		1.1		7.67		451		859		<0.001		0.001		<0.05		<0.001		<0.001		0.006		<0.005		<0.001		<0.1		<0.0001		0.050		0.018		<0.0005		2.80	
		6/15/2016		21.35	4945.46	2.13		162		19		1.0		7.61		556		1000		<0.001		0.001		<0.05		<0.001		<0.001		0.006		<0.005		<0.001		<0.1		<0.0001		0.036		0.024		<0.0005		1.30	U
		9/21/2016		21.45	4945.36	NS - Not enough water to sample.																																					
		2/14/2018		19.46	4947.35	NS														<0.001		<0.001		0.07		<0.001		<0.001		0.001		<0.005		<0.001		<0.1		<0.0001		0.072		0.004		<0.0005		1.9	
		5/23/2018		20.22	4946.59	1.37		85		19		1.1	J-	9.13		352	J-	689		<0.001		0.002		<0.05		<0.001		<0.001		<0.001		<0.005		<0.001		<0.1		<0.0001		0.045		0.003		<0.0005		1.3	

NS: Not Sampled
NM: Not Measured
GWE: Ground Water Elevation
DTW: Depth to Water
TOC: Top of Casing
AMSL: Above Mean Sea Level

Q: Data Validation Qualifier
J: Estimated
J+: Overestimated
UJ: Estimated Non-Detect
J-: Underestimated

5.1.1 Precision

Three field duplicates were collected in support of assessment and nature & extent monitoring at the Dave Johnston Power Plant, one per each sampling event. This equates to a field duplicate frequency of one field duplicate for every seven samples, exceeding the frequency outlined in the SAP of one field duplicate for every 20 samples (5%) and a total of 56 data points acquired. Two field duplicate results for radium, fell outside of the +/ 20% precision criteria, when both results were greater than five times the detection limit (EPA 2017). This equates to 3.6% of the field duplicate results that did not meet project precision goals. The remaining 96.4% met precision criteria defined for the project.

5.1.2 Accuracy

A total of 392 data points were acquired as part of assessment and nature & extent monitoring completed at the Ash Pond in 2018. Of these, 24 were qualified during data validation due to positive blank detections (UJ or J+) or matrix spikes outside of control limits (J+ or J-). This equates to 6.1% of results that received qualification. The remaining 93.9% met all accuracy criteria for the project without qualification.

5.1.3 Completeness

A total of 357 data points were collected from 10 monitoring wells at the Ash Pond. When precision and accuracy are given equal weight, 93.4% of the data met all project requirements. Although qualified results are assigned some uncertainty, all of the results (100%) are usable to support decision-making and to assess groundwater quality at the Ash Pond.

6.0 STATISTICAL METHOD SELECTION

The upper tolerance limit (UTL) approach was selected to evaluate background and downgradient groundwater quality for the Ash Pond. This method was selected, because it will support an examination of groundwater quality over time, regardless of the size of the data set. This means, a larger dataset and a smaller dataset with similar characteristics, should have similar UTLs over time. In addition, constituents exceeding the background, or the groundwater protection standard, will likely result from conditions originating from the CCR unit, not a change in the size of the data set. Using this approach, an upper tolerance limit for each constituent was established from the background data distribution and each constituent from the downgradient wells, was compared to the UTL to determine if an increase was observed above background.

6.1 Detection Monitoring

Results of detection monitoring for the Ash Pond (2017), revealed all Appendix III constituents except boron and TDS exceeded site-specific background concentrations (Table 6a). Based on these findings, the Ash Pond was transitioned to assessment monitoring in 2018.

Table 6a. Summary of Groundwater Quality Comparisons – Detection Monitoring

Constituent	Background Concentration (mg/L)	Downgradient Wells Exceeding the Background Concentration:
Boron	5.78	None exceed
Calcium	578	DJ-36
Chloride	102	DJ-34
Fluoride	0.8	DJ-12R, DJ-34, DJ-35, DJ-36, DJ-40
pH basic range	8.417	DJ-12R
pH acidic range	6.861	None exceed
Sulfate	1640	DJ-36
TDS	3030	None exceed

6.2 Assessment Monitoring

The *Final Rule* requires the owner or operator of a CCR unit to determine if groundwater protection standards have been exceeded for any Appendix IV constituents as part of assessment monitoring. For the Ash Pond, site-specific background (UTL) concentrations were combined with *EPA National Primary Drinking Water Standards* to create groundwater protection standards. The higher of these was adopted as the standard and 2018 assessment monitoring values were compared to them to determine if a release had occurred. This comparison is provided in Table 6b and reveals Appendix IV constituents: arsenic, cadmium, molybdenum, and radium exceeded the groundwater protection standard. As a result, PacifiCorp initiated a nature and extent investigation to bound the release from the Ash Pond.

Table 6b. Summary of Groundwater Quality Comparisons – Assessment Monitoring

Analyte	Upper Tolerance Limit (mg/L)	Maximum Contaminant Level (mg/L)	Groundwater Protection Standard (mg/L)	Downgradient Wells Exceeding the Groundwater Protection Standard
Antimony	0.001	0.006	0.006	None Exceed
Arsenic	0.012	0.01	0.012	DJ-35
Barium	1.2	2	2	None Exceed
Beryllium	0.004	0.004	0.004	None Exceed
Cadmium	0.00	0.005	0.005	DJ-36
Chromium	0.056	0.1	0.1	None Exceed
Cobalt	0.118	0.006	0.118	None Exceed
Fluoride	0.8	4	4	None Exceed
Lead	0.06	0.015	0.06	None Exceed
Lithium	0.1	0.040	0.1	None Exceed

Analyte	Upper Tolerance Limit (mg/L)	Maximum Contaminant Level (mg/L)	Groundwater Protection Standard (mg/L)	Downgradient Wells Exceeding the Groundwater Protection Standard
Mercury	0.0	0.002	0.002	None Exceed
Molybdenum	0.045	0.100	0.100	DJ-33, DJ-35
Radium	6.8	5	6.822	DJ-36
Selenium	0.01	0.05	0.05	None Exceed
Thallium	0.0005	0.002	0.002	None Exceed

7.0 NATURE & EXTENT OF RELEASE

Because groundwater protection standards were exceeded at the waste unit boundary, PacifiCorp has initiated a supplemental investigation to support an evaluation of the nature and extent of the release from the Ash Pond. The investigation utilizes data from existing wells, as well as new wells placed on the facility boundary to comply with the *Final Rule*, and to bound the release on the Dave Johnston Power Plant. The investigation will also incorporate data obtained from source material reflecting past disposal in Ash Pond. Results from these efforts are being evaluated and a report detailing the nature and extent of the release will be included in the Corrective Measures Study for the Ash Pond and the Annual Groundwater Monitoring and Corrective Action Report for 2019.

8.0 FINDINGS AND CONCLUSIONS

The results of the detection monitoring completed in 2017, revealed Appendix III constituents: calcium, chloride, fluoride, pH, and sulfate exceeded site-specific background concentrations in the downgradient monitoring wells (Table 6a). As a result, the Ash Pond was transitioned to assessment monitoring in 2018. The results of 2018 assessment monitoring concluded Appendix IV constituents: arsenic, cadmium, molybdenum, and radium exceeded their groundwater protection standards.

Based on this, PacifiCorp began the process to define the nature and extent of the release at the Dave Johnston Power Plant in accordance with the *Final Rule*. This work will be completed in 2019. In accordance with the *Final Rule*, because groundwater at the waste unit boundary exceeded groundwater protection standards, the Ash Pond will proceed to corrective measures in 2019.

9.0 UPCOMING YEAR

During 2019, it is anticipated PacifiCorp will complete the following activities at the Ash Pond:

Semi-Annual Monitoring

- Conduct the first semi-annual monitoring event for Appendix III and IV constituents;
- Perform statistical analysis of data;
- Conduct the second semi-annual monitoring event for Appendix III and IV constituents;
- Perform statistical analysis of data; and
- Develop the Annual Groundwater Monitoring and Corrective Action Report.

Corrective Measures

- Complete characterization and extent of release;
- Complete an assessment of corrective measures;
- Develop a corrective measures study;
- Conduct a public meeting to discuss the corrective measures study;
- Select the preferred remedy alternative;
- Begin remediation; and
- Develop a semi-annual corrective measures progress report.

10.0 REFERENCES

Atlatl 1996. Groundwater Contamination Study, Dave Johnston Power Plant, September 1, 1996.

EPA 2017. National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-201 7-001, January 2017.

EPA 2010. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater from Monitoring Wells, EPASOP-GW 001, January 2010.

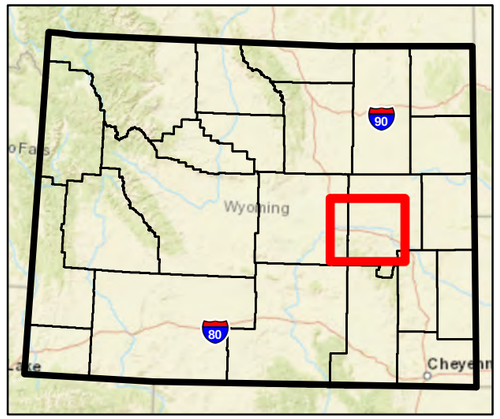
EPA 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A), EPA/540/1-89/002, December 1989.

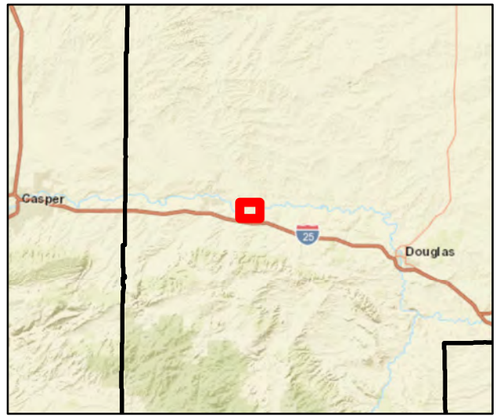
Morris, D.A. and Johnson, A.I. (1967). Summary of Hydrologic and Physical Properties of Rock and Soil Materials, as Analyzed by the Hydrologic Laboratory of the U.S. Geological Survey, 1948-1960. USGS Water Supply Paper: 1839-D. In Kresic N. 2007. Hydrogeology and Groundwater Modeling, p 111. CRC Press.

Rapp, J. R. and Durum, W.H. 1953. Reconnaissance of the Geology and Groundwater Resources of the La Prele Area, Converse County, Wyoming, USGS Geological Circular 243.

WET, 2017. Sampling and Analysis Plan & Well Documentation, Ash Ponds 4A&4B – Dave Johnston Power Plant, Glenrock, Wyoming, Revision 3, October 2017.

Figures





*Note background image is 2016
1 ft. resolution ESRI Aerial

Legend

- CCR Wells
- CCR Units

Feet

0 500 1,000 2,000

N
W E
S

PACIFICORP

WET Water & Environmental TECHNOLOGIES

DAVE JOHNSTON POWER PLANT

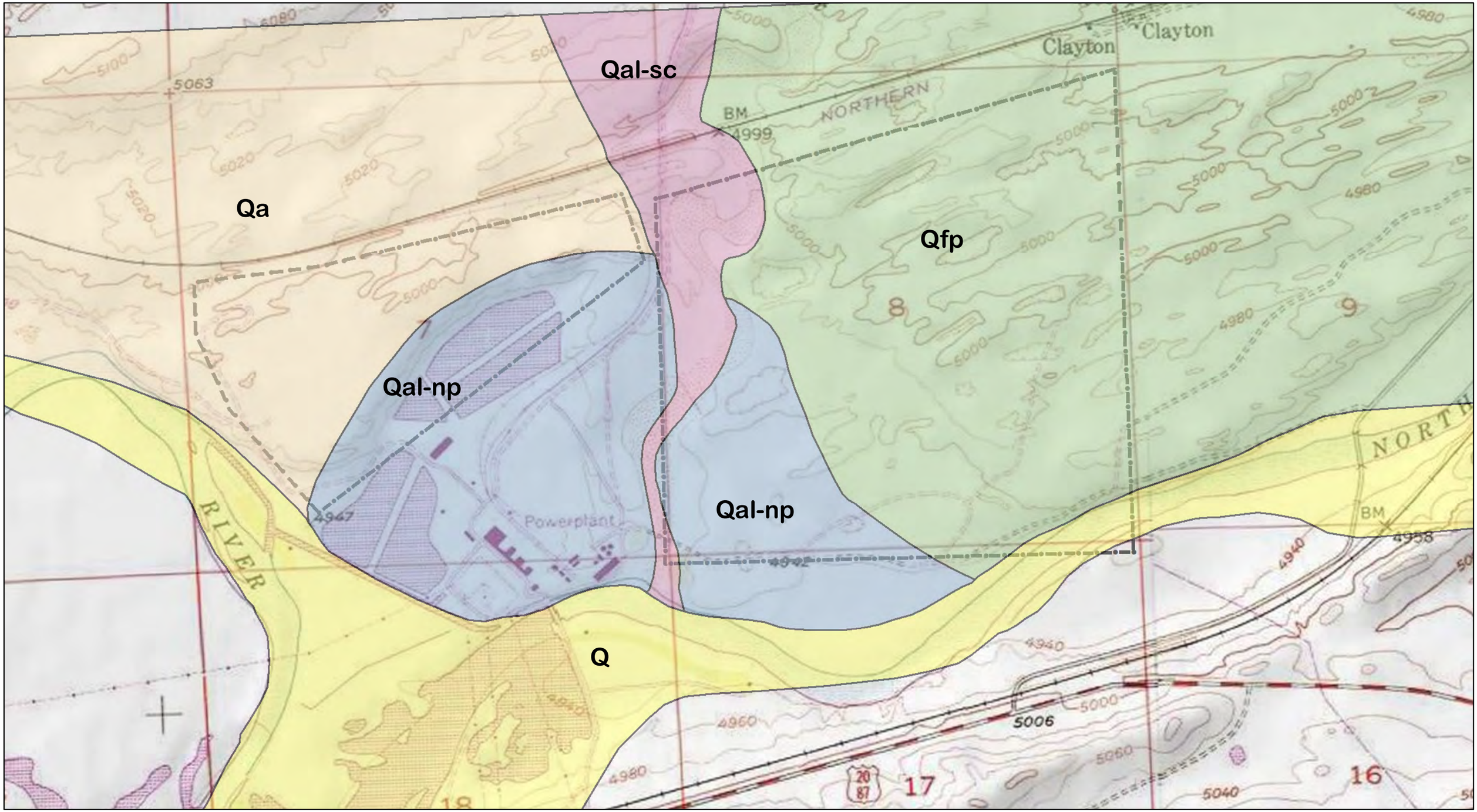
Ash Pond
CCR Sampling Locations

Job#: PERCM50

Date: 1/22/2018

FIGURE 1

Path: M:\PERC_CCR\Dave_Johnston\AshPond_CCR_Sampling.mxd, Author: brutherford



Legend

- Qal-sc, Sand Creek
- Qal-np, North Platte
- Qa, Aeolian
- Qfp, Flood Plain
- Q, Recent
- Permit_Bound

N
W E
S

Feet

0 500 1,000 2,000 3,000 4,000 5,000

PACIFICORP

Water & Environmental TECHNOLOGIES

DAVE JOHNSTON POWER PLANT

Geologic Map - First Water Bearing Zone

Job#: PERCM55

Date: 10/25/2017

FIGURE 2

Path: M:\PERC_CCR\Dave_Johnston\Figure2_Geology.mxd, Author: jleprowse

Attachment A

Field Summary Report – February 2018 Event

Facility Name: Dave Johnston Power Plant – Ash Pond
Event Description: Assessment Monitoring
Event Dates: February 14, 2018
Field Personnel: Laura Watson, Daulton Williams

ACTIVITY SUMMARY. WET personnel arrived onsite February 14, 2018 and performed ground water sampling at Dave Johnston Ash Pond. Prior to collecting samples, field instruments were calibrated, followed by the collection of water levels in the CCR monitoring wells. After recording water levels, the wells were purged in accordance with the EPA low-flow method. Field parameters were monitored during well purging in accordance with the site-specific sampling and analysis plan (SAP). Once field parameters met the SAP stabilization requirements, ground water samples were collected for Appendix IV constituents. All calibration data and field measurements were recorded on the WET electronic field form. The wells that underwent sampling during this sampling event included:

- DJ-2
- DJ-3
- DJ-12R
- DJ-33
- DJ-34
- DJ-35
- DJ-36
- DJ-37
- DJ-38
- DJ-40

The following details dates for conducting fieldwork and post-fieldwork data processing:

- Date fieldwork completed: February 14, 2018
- Dates unvalidated lab data received: March 9, 2018
- Data validation completion date: March 19, 2018

After collection, the samples were preserved in accordance with the SAP, placed on ice, chain of custody forms were completed, and the samples were transported to Energy Laboratories in Casper, WY for analysis on February 15, 2018. The following information is attached to this summary as a supplement:

- Attachment A: Groundwater Contour Map
- Attachment B: Data Validation Summary
- Attachment C: Field Data Sheets
- Attachment D: Laboratory Analytical Reports

SAP DEVIATIONS. There were no deviations from the SAP during this sampling event.

Attachment A:

Groundwater Contour Map

N
W E
S

Feet

0 300 600 1,200 1,800 2,400

PACIFICORP

Water & Environmental TECHNOLOGIES

DAVE JOHNSTON POWER PLANT

Groundwater Elevation Map
Ash Pond

Job#: PERCM050

Date: 5/1/2018

Attachment D

Path: M:\PERC_CCR\Feb_2018_Sampling\All_Sites_DDPs.mxd, Author: brutherford

Attachment B:

Data Validation Summary

DATA VALIDATION SUMMARY
CCR COMPLIANCE SAMPLING

Facility Name:	Dave Johnston Plant	
Validator:	Tim Driscoll 03/19/18	
Reviewer:	Pat Seccomb 03-21-18	
Laboratory:	Energy Laboratories	
Laboratory Work Order#:	C18020384	
Sample Media:	Groundwater	
Analytical Parameters:	**Appendix IV:** Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, Tl, Ra^{226} + Ra^{228}	
Review Element:	**Complete / Criteria Met? (Yes/No)**	**If no, describe:**
Chain of Custody:	Yes	
Field Documentation:	Yes	
Holding Times & Sample Preservation:	Yes	
Calibrations:	Yes	
Blanks:	Yes	
Laboratory Control Sample:	Yes	
Laboratory Duplicate:	Yes	
Matrix Spike:	Yes	
Overall Assessment:		
No qualifications were required.		

Attachment C:

Field Data Sheets

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	DW	**Project Number:**	PERCM050
Sample ID:	DJ-35	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Clear windy		
Depth to Water (ft):	15.19	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	15.20

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.10	2,206	0.20	7.91	46.30	72.00
6	12.10	2,149	0.13	8.00	14.30	72.00
8	12.10	2,109	0.12	8.10	-22.40	23.20

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	17:47

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	DW	**Project Number:**	PERCM050
Sample ID:	DJ-36	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Clear windy		
Depth to Water (ft):	17.16	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	17.54

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.00	1,507	0.32	7.73	202.00	290.00
6	12.00	1,803	1.15	7.74	197.60	290.00
8	12.00	1,841	1.72	7.76	196.20	309.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	17:07

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water yellow colored

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	DW	**Project Number:**	PERCM050
Sample ID:	DJ-38	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Clear windy		
Depth to Water (ft):	10.07	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	11.00

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	10.10	3,247	3.19	7.15	238.50	90.70
6	11.40	3,582	1.63	7.08	235.70	90.70
8	11.00	3,337	1.94	7.15	231.70	41.70
10	10.90	3,149	1.59	7.20	229.60	25.50

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	15:53

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	DW	**Project Number:**	PERCM050
Sample ID:	DJ-33	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Clear windy		
Depth to Water (ft):	17.96	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	18.06

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	11.40	3,083	0.18	7.43	223.50	252.00
6	11.50	2,985	0.15	7.42	221.20	252.00
8	11.40	2,911	0.11	7.43	219.70	68.20

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	16:15

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-34	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	30 wind		
Depth to Water (ft):	17.29	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	18.03

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.70	1,587	0.19	7.52	353.60	63.50
6	12.70	1,575	0.25	7.50	354.10	63.50
8	12.70	1,568	0.42	7.51	354.60	79.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	17:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Red-brown tint

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-12R	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	30 wind		
Depth to Water (ft):	16.76	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	16.83

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.70	1,895	0.25	7.99	381.60	55.70
6	12.70	1,879	0.23	8.33	379.00	55.70
8	12.70	1,843	0.15	8.55	376.90	23.70

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	17:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

DUP-1 @ 1710

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-40	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	30 wind		
Depth to Water (ft):	19.21	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	20.14

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.50	1,161	1.45	7.51	371.90	11.80
6	12.50	1,163	1.41	7.51	372.10	11.80
8	12.40	1,164	1.46	7.51	372.40	7.97

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	9:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

FB-1 @1720, well not producing, had a hard time getting enough water

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-37	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	30 wind		
Depth to Water (ft):	17.04	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	19.00

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.70	3,906	1.55	6.95	381.80	54.30
6	12.60	3,907	1.58	6.95	381.90	54.30
8	12.50	3,905	1.53	6.95	382.10	10.80

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	16:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-3	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	30 wind		
Depth to Water (ft):	20.24	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	21.54

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	11.90	631	0.26	7.34	358.50	423.00
6	12.00	632	0.20	7.34	356.00	423.00
8	12.00	632	0.16	7.34	353.80	298.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	16:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring - Ash Pond		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-2	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	2/14/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	30 wind		
Depth to Water (ft):	24.31	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	24.82

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.30	1,042	0.21	7.80	380.90	60.10
6	12.20	1,040	0.30	7.80	381.10	60.10
8	12.30	1,033	0.22	7.79	381.00	41.90

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	15:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Attachment D:

Laboratory Analytical Report

ANALYTICAL SUMMARY REPORT

March 09, 2018

PacifiCorp Dave Johnston Plant
1591 Tank Farm Road
Glenrock, WY 82637

Work Order: C18020384 Quote ID: C5218 - Pacific Corp

Project Name: PERCM50

Energy Laboratories, Inc. Casper WY received the following 12 samples for PacifiCorp Dave Johnston Plant on 2/15/2018 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C18020384-001	DJ-3	02/14/18 16:00	02/15/18	Aqueous	Metals by ICP/ICPMS, Total Mercury, Total Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA Radium 226 + Radium 228 Radium 226, Total Radium 228, Total
C18020384-002	DJ-2	02/14/18 15:30	02/15/18	Aqueous	Same As Above
C18020384-003	DJ-37	02/14/18 16:30	02/15/18	Aqueous	Same As Above
C18020384-004	DJ-40	02/14/18 17:00	02/15/18	Aqueous	Same As Above
C18020384-005	FB-1	02/14/18 17:20	02/15/18	Aqueous	Same As Above
C18020384-006	DJ-12R	02/14/18 17:30	02/15/18	Aqueous	Same As Above
C18020384-007	DUP-1	02/14/18 17:10	02/15/18	Aqueous	Same As Above
C18020384-008	DJ-34	02/14/18 17:45	02/15/18	Aqueous	Metals by ICP/ICPMS, Total Mercury, Total Preservation by the Laboratory Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA Radium 226 + Radium 228 Radium 226, Total Radium 228, Total
C18020384-009	DJ-38	02/14/18 15:53	02/15/18	Aqueous	Metals by ICP/ICPMS, Total Mercury, Total Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA Radium 226 + Radium 228 Radium 226, Total Radium 228, Total
C18020384-010	DJ-33	02/14/18 16:15	02/15/18	Aqueous	Same As Above
C18020384-011	DJ-36	02/14/18 17:07	02/15/18	Aqueous	Same As Above
C18020384-012	DJ-35	02/14/18 17:47	02/15/18	Aqueous	Same As Above

The results as reported relate only to the item(s) submitted for testing. The analyses presented in this report were performed at Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these test results, please call.

ANALYTICAL SUMMARY REPORT

Report Approved By:

CLIENT: PacifiCorp Dave Johnston Plant
Project: PERCM50
Work Order: C18020384

Report Date: 03/09/18

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.
Prep Comments for Sample C18020384-008A, Test PRESERVATION: - The sample fraction submitted for Metals Analysis was received in the laboratory with a pH of ~ 7. This is outside of the method specified requirement of pH < 2. Proper preservation was added before sample analysis.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-001
Client Sample ID: DJ-3

Report Date: 03/09/18
Collection Date: 02/14/18 16:00
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Barium	0.18	mg/L		0.05		E200.7	02/23/18 12:12 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Chromium	0.004	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 14:45 / eli-b
Lead	0.005	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:12 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:43 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 14:45 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 14:45 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	1.5	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.4	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	1.1	pCi/L	U			RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	0.9	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	2.0	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	2.7	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	2.0	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-002
Client Sample ID: DJ-2

Report Date: 03/09/18
Collection Date: 02/14/18 15:30
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Barium	0.06	mg/L		0.05		E200.7	02/23/18 12:16 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 14:48 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:16 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:49 / eli-b
Molybdenum	0.001	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 14:48 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 14:48 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	0.9	pCi/L	U			RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	1.3	pCi/L	U			A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.2	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-003
Client Sample ID: DJ-37

Report Date: 03/09/18
Collection Date: 02/14/18 16:30
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 14:51 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 14:51 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:20 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:50 / eli-b
Molybdenum	0.007	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 14:51 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 14:51 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.7	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	1.4	pCi/L	U			RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.7	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	2.1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.7	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-004
Client Sample ID: DJ-40

Report Date: 03/09/18
Collection Date: 02/14/18 17:00
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Barium	0.07	mg/L		0.05		E200.8	02/23/18 14:54 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Chromium	0.001	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 14:54 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:24 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:52 / eli-b
Molybdenum	0.072	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Selenium	0.004	mg/L		0.001		E200.8	02/23/18 14:54 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 14:54 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	1.6	pCi/L	U			RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	1.9	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-005
Client Sample ID: FB-1

Report Date: 03/09/18
Collection Date: 02/14/18 17:20
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 14:57 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 14:57 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:27 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:54 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 14:57 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 14:57 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.1	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	0.7	pCi/L	U			RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	0.9	pCi/L	U			A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-006
Client Sample ID: DJ-12R

Report Date: 03/09/18
Collection Date: 02/14/18 17:30
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Arsenic	0.007	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 15:00 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 15:00 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:31 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:56 / eli-b
Molybdenum	0.038	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Selenium	0.013	mg/L		0.001		E200.8	02/23/18 15:00 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:00 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	1.7	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.7	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	2.1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.7	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-007
Client Sample ID: DUP-1

Report Date: 03/09/18
Collection Date: 02/14/18 17:10
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Arsenic	0.007	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 15:03 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 15:03 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:35 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 14:58 / eli-b
Molybdenum	0.038	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Selenium	0.013	mg/L		0.001		E200.8	02/23/18 15:03 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:03 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.3	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	2.8	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.6	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	3.2	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.4	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.6	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-008
Client Sample ID: DJ-34

Report Date: 03/09/18
Collection Date: 02/14/18 17:45
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Barium	0.06	mg/L		0.05		E200.8	02/23/18 15:06 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Cobalt	0.013	mg/L		0.005		E200.8	02/23/18 15:06 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:39 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 15:00 / eli-b
Molybdenum	0.062	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 15:06 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:06 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.8	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	3.2	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.3	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.7	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	4.0	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.3	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.7	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-009
Client Sample ID: DJ-38

Report Date: 03/09/18
Collection Date: 02/14/18 15:53
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 15:15 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Cadmium	0.003	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Chromium	0.001	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	02/23/18 15:15 / eli-b
Lead	ND	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Lithium	0.1	mg/L		0.1		E200.7	02/23/18 12:43 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 15:02 / eli-b
Molybdenum	0.006	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	02/23/18 15:15 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:15 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.6	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	2.6	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.2	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	3.2	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.2	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-010
Client Sample ID: DJ-33

Report Date: 03/09/18
Collection Date: 02/14/18 16:15
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Arsenic	0.001	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 15:18 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Chromium	0.002	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Cobalt	0.006	mg/L		0.005		E200.8	02/23/18 15:18 / eli-b
Lead	0.002	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:47 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 15:04 / eli-b
Molybdenum	0.133	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Selenium	0.014	mg/L		0.001		E200.8	02/23/18 15:18 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:18 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.6	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	2.0	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 228 MDC	1.7	pCi/L				RA-05	03/01/18 07:42 / plj
Radium 226 + Radium 228	2.5	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.4	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	1.7	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-011
Client Sample ID: DJ-36

Report Date: 03/09/18
Collection Date: 02/14/18 17:07
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Arsenic	0.004	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Barium	0.16	mg/L		0.05		E200.8	02/23/18 15:20 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Cadmium	0.013	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Chromium	0.010	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Cobalt	0.096	mg/L		0.005		E200.8	02/23/18 15:20 / eli-b
Lead	0.010	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 12:58 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 15:09 / eli-b
Molybdenum	0.042	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 15:20 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:20 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	4.3	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.9	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	3.3	pCi/L				RA-05	03/01/18 09:17 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	03/01/18 09:17 / plj
Radium 228 MDC	2.1	pCi/L				RA-05	03/01/18 09:17 / plj
Radium 226 + Radium 228	7.7	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.7	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	2.1	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Project: PERCM50
Lab ID: C18020384-012
Client Sample ID: DJ-35

Report Date: 03/09/18
Collection Date: 02/14/18 17:47
DateReceived: 02/15/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Arsenic	0.010	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Barium	ND	mg/L		0.05		E200.8	02/23/18 15:23 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Cadmium	0.002	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Chromium	ND	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Cobalt	0.045	mg/L		0.005		E200.8	02/23/18 15:23 / eli-b
Lead	0.002	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Lithium	ND	mg/L		0.1		E200.7	02/23/18 13:02 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	03/02/18 15:11 / eli-b
Molybdenum	0.102	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Selenium	ND	mg/L		0.001		E200.8	02/23/18 15:23 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	02/23/18 15:23 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.3	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	03/07/18 10:52 / arh
Radium 228	0.2	pCi/L	U			RA-05	03/01/18 09:17 / plj
Radium 228 precision (±)	1.2	pCi/L				RA-05	03/01/18 09:17 / plj
Radium 228 MDC	2.0	pCi/L				RA-05	03/01/18 09:17 / plj
Radium 226 + Radium 228	0.5	pCi/L	U			A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 precision (±)	1.2	pCi/L				A7500-RA	03/08/18 16:09 / sec
Radium 226 + Radium 228 MDC	2.0	pCi/L				A7500-RA	03/08/18 16:09 / sec

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp Dave Johnston Plant
Report Date: 03/08/18
Project: PERC M 50
Work Order: C18020384

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.7**								Analytical Run: ICP204-B_180223A	
Lab ID: **ICV**	Continuing Calibration Verification Standard							02/23/18 10:31	
Barium	2.45	mg/L	0.10	98	95	105			
Lithium	1.27	mg/L	0.10	101	95	105			
Method: **E200.7**								Batch: 118675	
Lab ID: **MB-118675**	Method Blank				Run: ICP204-B_180223A			02/23/18 11:57	
Barium	ND	mg/L	0.01						
Lithium	ND	mg/L	0.008						
Lab ID: **C18020384-012AMS3**	Sample Matrix Spike				Run: ICP204-B_180223A			02/23/18 13:13	
Barium	0.513	mg/L	0.060	103	70	130			
Lithium	0.553	mg/L	0.10	111	70	130			
Lab ID: **C18020384-012AMSD3**	Sample Matrix Spike Duplicate				Run: ICP204-B_180223A			02/23/18 13:17	
Barium	0.515	mg/L	0.060	103	70	130	0.4	20	
Lithium	0.565	mg/L	0.10	113	70	130	2.2	20	
Lab ID: **LCS-118675**	Laboratory Control Sample				Run: ICP204-B_180223A			02/23/18 14:11	
Barium	0.490	mg/L	0.10	98	85	115			
Lithium	0.532	mg/L	0.10	106	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp Dave Johnston Plant
Report Date: 03/08/18
Project: PERC M 50
Work Order: C18020384

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8								Analytical Run: ICPMS207-B_180222A	
Lab ID: QCS	Initial Calibration Verification Standard								02/22/18 17:43
Antimony	0.0499	mg/L	0.050	100	90	110			
Arsenic	0.0493	mg/L	0.0050	99	90	110			
Barium	0.0495	mg/L	0.10	99	90	110			
Beryllium	0.0246	mg/L	0.0010	98	90	110			
Cadmium	0.0253	mg/L	0.0010	101	90	110			
Chromium	0.0500	mg/L	0.010	100	90	110			
Cobalt	0.0538	mg/L	0.010	108	90	110			
Lead	0.0487	mg/L	0.010	97	90	110			
Molybdenum	0.0485	mg/L	0.0050	97	90	110			
Selenium	0.0494	mg/L	0.0050	99	90	110			
Thallium	0.0483	mg/L	0.10	97	90	110			
Lab ID: QCS	Initial Calibration Verification Standard								02/23/18 13:16
Antimony	0.0510	mg/L	0.050	102	90	110			
Arsenic	0.0495	mg/L	0.0050	99	90	110			
Barium	0.0503	mg/L	0.10	101	90	110			
Beryllium	0.0257	mg/L	0.0010	103	90	110			
Cadmium	0.0256	mg/L	0.0010	102	90	110			
Chromium	0.0498	mg/L	0.010	100	90	110			
Cobalt	0.0542	mg/L	0.010	108	90	110			
Lead	0.0498	mg/L	0.010	100	90	110			
Molybdenum	0.0484	mg/L	0.0050	97	90	110			
Selenium	0.0509	mg/L	0.0050	102	90	110			
Thallium	0.0496	mg/L	0.10	99	90	110			
Method: E200.8									Batch: 118675
Lab ID: MB-118675	Method Blank				Run: ICPMS207-B_180222A				02/23/18 13:25
Antimony	ND	mg/L	0.0004						
Arsenic	ND	mg/L	0.0001						
Barium	ND	mg/L	0.00009						
Beryllium	ND	mg/L	0.0001						
Cadmium	ND	mg/L	0.00003						
Chromium	ND	mg/L	0.0002						
Cobalt	ND	mg/L	0.00004						
Lead	ND	mg/L	0.00008						
Molybdenum	ND	mg/L	0.0001						
Selenium	ND	mg/L	0.0002						
Thallium	ND	mg/L	0.00005						
Lab ID: LCS-118675	Laboratory Control Sample				Run: ICPMS207-B_180222A				02/23/18 13:34
Antimony	0.499	mg/L	0.0050	100	85	115			
Arsenic	0.520	mg/L	0.0010	104	85	115			
Barium	0.456	mg/L	0.010	91	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp Dave Johnston Plant
Report Date: 03/08/18
Project: PERC M 50
Work Order: C18020384

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Batch: 118675
Lab ID: LCS-118675	Laboratory Control Sample				Run: ICPMS207-B_180222A				02/23/18 13:34
Beryllium	0.247	mg/L	0.0010	99	85	115			
Cadmium	0.226	mg/L	0.0010	90	85	115			
Chromium	0.502	mg/L	0.0010	100	85	115			
Cobalt	0.473	mg/L	0.0010	95	85	115			
Lead	0.502	mg/L	0.0010	100	85	115			
Molybdenum	0.484	mg/L	0.0050	97	85	115			
Selenium	0.498	mg/L	0.0050	100	85	115			
Thallium	0.492	mg/L	0.0010	98	85	115			
Lab ID: C18020384-012AMS3	Sample Matrix Spike				Run: ICPMS207-B_180222A				02/23/18 15:26
Antimony	0.519	mg/L	0.0010	104	70	130			
Arsenic	0.530	mg/L	0.0010	104	70	130			
Barium	0.491	mg/L	0.050	93	70	130			
Beryllium	0.234	mg/L	0.0010	94	70	130			
Cadmium	0.226	mg/L	0.0010	90	70	130			
Chromium	0.497	mg/L	0.0050	99	70	130			
Cobalt	0.512	mg/L	0.0050	93	70	130			
Lead	0.504	mg/L	0.0010	100	70	130			
Molybdenum	0.586	mg/L	0.0010	97	70	130			
Selenium	0.492	mg/L	0.0010	98	70	130			
Thallium	0.488	mg/L	0.00050	98	70	130			
Lab ID: C18020384-012AMSD3	Sample Matrix Spike Duplicate				Run: ICPMS207-B_180222A				02/23/18 15:29
Antimony	0.514	mg/L	0.0010	103	70	130	1.1	20	
Arsenic	0.535	mg/L	0.0010	105	70	130	0.9	20	
Barium	0.488	mg/L	0.050	92	70	130	0.6	20	
Beryllium	0.238	mg/L	0.0010	95	70	130	1.4	20	
Cadmium	0.221	mg/L	0.0010	88	70	130	2.3	20	
Chromium	0.498	mg/L	0.0050	99	70	130	0.2	20	
Cobalt	0.513	mg/L	0.0050	94	70	130	0.3	20	
Lead	0.509	mg/L	0.0010	102	70	130	1.0	20	
Molybdenum	0.580	mg/L	0.0010	96	70	130	1.0	20	
Selenium	0.490	mg/L	0.0010	98	70	130	0.5	20	
Thallium	0.494	mg/L	0.00050	99	70	130	1.3	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp Dave Johnston Plant
Report Date: 03/08/18
Project: PERC M 50
Work Order: C18020384

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E245.1**								Analytical Run: HGCV202-B_180302A	
Lab ID: **ICV**	Initial Calibration Verification Standard							03/02/18 13:37	
Mercury	0.00188	mg/L	0.00010	94	90	110			
Method: **E245.1**								Batch: 118929	
Lab ID: **MB-118929**	Method Blank				Run: HGCV202-B_180302A			03/02/18 14:35	
Mercury	0.00002	mg/L	1E-06						
Lab ID: **LCS-118929**	Laboratory Control Sample				Run: HGCV202-B_180302A			03/02/18 14:37	
Mercury	0.00190	mg/L	0.00010	94	85	115			
Lab ID: **C18020384-001AMS**	Sample Matrix Spike				Run: HGCV202-B_180302A			03/02/18 14:45	
Mercury	0.00191	mg/L	0.00010	94	70	130			
Lab ID: **C18020384-001AMSD**	Sample Matrix Spike Duplicate				Run: HGCV202-B_180302A			03/02/18 14:47	
Mercury	0.00192	mg/L	0.00010	94	70	130	0.5	30	
Lab ID: **B18021303-002CMS**	Sample Matrix Spike				Run: HGCV202-B_180302A			03/02/18 15:17	
Mercury	0.00192	mg/L	0.00010	95	70	130			
Lab ID: **B18021303-002CMSD**	Sample Matrix Spike Duplicate				Run: HGCV202-B_180302A			03/02/18 15:19	
Mercury	0.00190	mg/L	0.00010	94	70	130	0.7	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Report Date: 03/08/18
Project: PERC M 50
Work Order: C18020384

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0									Batch: RA226-8851R	
Lab ID: LCS-RA226-8851		Laboratory Control Sample				Run: G542M-2_180223A			03/06/18 10:34	
Radium 226		8.6	pCi/L		83	80	120			
Method: E903.0									Batch: RA226-8851R	
Lab ID: MB-RA226-8851	3	Method Blank				Run: G542M-2_180223B			03/07/18 10:52	
Radium 226		0.3	pCi/L							
Radium 226 precision (±)		0.2	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C18020410-002EMS		Sample Matrix Spike				Run: G542M-2_180223B			03/07/18 13:01	
Radium 226		22	pCi/L		94	70	130			
Lab ID: C18020410-002EMSD		Sample Matrix Spike Duplicate				Run: G542M-2_180223B			03/07/18 13:01	
Radium 226		26	pCi/L		114	70	130	17	20	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp Dave Johnston Plant
Report Date: 03/08/18
Project: PERC M 50
Work Order: C18020384

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05										Batch: RA228-5728
Lab ID: LCS-228-RA226-8851		Laboratory Control Sample				Run: TENNELEC-3_180223A				03/01/18 07:42
Radium 228		9.2	pCi/L		91	80	120			
Lab ID: MB-RA226-8851	3	Method Blank				Run: TENNELEC-3_180223A				03/01/18 07:42
Radium 228		0.6	pCi/L							U
Radium 228 precision (±)		1	pCi/L							
Radium 228 MDC		2	pCi/L							
Lab ID: C18020410-003EMS		Sample Matrix Spike				Run: TENNELEC-3_180223A				03/01/18 07:42
Radium 228		33	pCi/L		112	70	130			
Lab ID: C18020410-003EMSD		Sample Matrix Spike Duplicate				Run: TENNELEC-3_180223A				03/01/18 07:42
Radium 228		28	pCi/L		84	70	130	17	20	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

Work Order Receipt Checklist

PacifiCorp Dave Johnston Plant C18020384

Login completed by: Dorian Quis
Date Received: 2/15/2018
Reviewed by: Kasey Vidick
Received by: dcq
Reviewed Date: 2/16/2018
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	1.1°C On Ice		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

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.

Contact and Corrective Action Comments:

None

Chain of Custody & Analytical Request Record

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Account Information (Billing information)

Company/Name	PacifiCorp-UT
Contact	Jeff Tucker
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Invoice	☐Hard Copy ■Email
Receive Report	☐Hard Copy ■Email
Purchase Order	
Quote	C4503 - Pacific Corp
Bottle Order	

Report Information (if different than Account Information)

Company/Name	WET
Contact	Dave Erickson
Phone	(406) 782-5220
Mailing Address	
City, State, Zip	
Email	derickson@waterenvtech.com
Receive Report	☐Hard Copy ■Email

Special Report/Formats:
☐ LEVEL IV ☐ NELAC ■ EDD/EDT (contact laboratory) ☐ Other_____

Comments

Please CC Laura Watson with results (EDD csv and PDF)

Project Information

Project Name, PWSID, Permit, etc.	PERCM50
Sampler Name	LWatson
Sampler Phone	931-2447
Sample Origin State	Montana
EPA/State Compliance	■ Yes ☐ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

Analysis Requested

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Total Metals	Total Mercury	Alkalinity	TDS, pH, E300.0 Anions	Nitrogen, Nitrate+Nitrite	Radium 226 + Radium 228	fluoride	Appendix IV		See Attached	RUSH TAT	Energy Lab ID (Laboratory use only)
1	DJ-3	2/14/18	1600	4	W	✓	✓	✓	✓	✓	✓	✓	X				
2	DJ-2		1530	4	W	✓	✓	✓	✓	✓	✓	✓					C18020384
3	DJ-37		1630	4	W	✓	✓	✓	✓	✓	✓	✓					
4	DJ-40		1700	4	W	✓	✓	✓	✓	✓	✓	✓					
5	FB-1		1720	4	W	✓	✓	✓	✓	✓	✓	✓					
6	DJ-12R		1730	4	W	✓	✓	✓	✓	✓	✓	✓					
7	Dup-1		1710	4	W	✓	✓	✓	✓	✓	✓	✓					
8	DJ-34		1745	4	W	✓	✓	✓	✓	✓	✓	✓					
9				4	W	✓	✓	✓	✓	✓	✓	✓					
10				4	W	✓	✓	✓	✓	✓	✓	✓					

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Daltin Williams	2/15/18 8:04				
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature
					2/15/18 822	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp °C	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
Hand	Various	Y N C B	Y N	Various	Y N	Y N	CC Cash Check_____	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

Chain of Custody & Analytical Request Record

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Page 2 of 5

Account Information (Billing information)

Company/Name	PacifiCorp-UT
Contact	Jeff Tucker
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Invoice ☐Hard Copy ☒Email	Receive Report ☐Hard Copy ☒Email
Purchase Order	Quote C4503 - Pacific Corp; Bottle Order

Report Information (if different than Account Information)

Company/Name	WET
Contact	Dave Erickson
Phone	(406) 782-5220
Mailing Address	
City, State, Zip	
Email	derickson@waterenvtech.com
Receive Report	☐Hard Copy ☒Email
Special Report/Formats:	☐ LEVEL IV ☐ NELAC ☒ EDD/EDT (contact laboratory) ☐ Other

Comments

Please CC Laura Watson with results (EDD csv and PDF)

Project Information

Project Name, PWSID, Permit, etc.	PERCM50
Sampler Name	D Williams
Sampler Phone	406-249-0173
Sample Origin State	Montana
EPA/State Compliance	☒ Yes ☐ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Analysis Requested

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Total Metals	Total Mercury	Alkalinity	TDS, pH, E300.0 Anions	Nitrogen, Nitrate+Nitrite	Radium 226 + Radium 228	fluoride	Appendix IV		See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	DJ-38	2-14-18	15:53	4	W	✓	✓	✓	✓	✓	✓	✓					
2	DJ-33	2-14-18	16:15	4	W	✓	✓	✓	✓	✓	✓	✓					C18020384
3	DJ-36	2-14-18	17:07	4	W	✓	✓	✓	✓	✓	✓	✓					
4	DJ-35	2-14-18	17:47	4	W	✓	✓	✓	✓	✓	✓	✓					
5				4	W	✓	✓	✓	✓	✓	✓	✓					
6				4	W	✓	✓	✓	✓	✓	✓	✓					
7				4	W	✓	✓	✓	✓	✓	✓	✓					
8				4	W	✓	✓	✓	✓	✓	✓	✓					
9				4	W	✓	✓	✓	✓	✓	✓	✓					
10				4	W	✓	✓	✓	✓	✓	✓	✓					

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Dalton Williams	2/15/18 8:04	Dab Wil			
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time 2/15/18 822	Signature

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp °C	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
Hand	Various	Y (N) C B	Y (N)	Various	(Y) N	(Y) N	CC Cash Check	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

Attachment B

Field Summary Report – May 2018 Event

Facility Name: Dave Johnston Power Plant – Ash Pond (formerly 4A & 4B)
Event Description: Assessment Monitoring
Event Dates: May 23-24, 2018
Field Personnel: Laura Watson, Mandy Machinal

ACTIVITY SUMMARY. WET personnel arrived onsite May 23, 2018 and performed ground water sampling at the Dave Johnston Ash Pond. Prior to collecting samples, field instruments were calibrated, followed by the collection of water levels in the CCR monitoring wells. After recording water levels, the wells were purged in accordance with the EPA low-flow method. Field parameters were monitored during well purging in accordance with the site-specific sampling and analysis plan (SAP). Once field parameters met the SAP stabilization requirements, ground water samples were collected for Appendix III and IV constituents. All calibration data and field measurements were recorded on the WET electronic field form. The wells that underwent sampling during this sampling event included:

- DJ-2
- DJ-3
- DJ-34
- DJ-12R
- DJ-35
- DJ-33
- DJ-36
- DJ-37
- DJ-38
- DJ-40

The following details dates for conducting fieldwork and post-fieldwork data processing:

- Date fieldwork completed: May 23, 2018
- Dates unvalidated lab data received: June 20, 2018
- Data validation completion date: July 18, 2018

After collection, the samples were preserved in accordance with the SAP, placed on ice, chain of custody forms were completed, and the samples were transported to Energy Laboratories in Casper, WY for analysis on May 24, 2018. The following information is attached to this summary as a supplement:

- Attachment A: Groundwater Contour Map
- Attachment B: Data Validation Summary
- Attachment C: Statistical Analysis
- Attachment D: Field Data Sheets
- Attachment E: Laboratory Analytical Reports

SAP DEVIATIONS. None.

Attachment A:

Groundwater Contour Map

N
W E
S

Feet

0 300 600 1,200 1,800 2,400

PACIFICORP

Water & Environmental TECHNOLOGIES

DAVE JOHNSTON POWER PLANT

Groundwater Elevation Map
Ash Pond

Job#: PERCM050

Date: 8/13/2018

Attachment 1

Path: M:\PERC_CCR\2018_May_Sampling\2018_May_All Sites_DDPs.mxd, Author: brutherford

Attachment B:

Data Validation Summary

DATA VALIDATION SUMMARY
CCR COMPLIANCE SAMPLING

Facility Name:	Dave Johnson sampled 5/23/2018	
Validator:	Tim Driscoll 7/16/2018	
Reviewer:	Pat Seccomb 7-18-18	
Laboratory:	Energy Laboratory	
Laboratory Work Order#:	C18050869	
Sample Media:	Groundwater	
Analytical Parameters:	**Appendix III:** B, Ca, Cl, ^{1}F, pH, $S0_4$, TDS **Appendix IV:** Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, Tl, Ra^{226} + Ra^{228}	
Review Element:	**Complete / Criteria Met? (Yes/No)**	**If no, describe:**
Chain of Custody:	Yes	
Field Documentation:	Yes	
Holding Times & Sample Preservation:	Yes	
Calibrations:	Yes	
Blanks:	No	There were low-level detections in laboratory method blanks that resulted in J+ qualifications for Chromium, Lead, Selenium, and Molybdenum. Qualifications are detailed below.
Laboratory Control Sample:	Yes	
Laboratory Duplicate:	Yes	
Matrix Spike:	No	Several constituents fell outside of recovery criteria in Matrix Spikes that resulted in qualifications for Sodium, Fluoride and Sulfate. Qualifications are detailed below.

Overall Assessment:

The following results were qualified due to low-level detections in laboratory method blanks:

- Chromium was qualified J+ in samples DJ-38, DJ-2, and DJ-44.
- Lead was qualified J+ in samples DJ-2, DJ-43, and DJ-35.
- Selenium was qualified J+ in sample DJ-2.

The following results were qualified due to recovery problems in Matrix Spikes and Matrix Spike Duplicates:

- Sodium was qualified J+ in the following samples because of a high recovery: DJ-38, DJ-3, DJ-2, DJ-34, HS-2, HS-3, DJ-47, DJ-46, DJ-45, DJ-44, DJ-12R, DJ-43, DJ-37, DJ-36, DJ-40, and DJ-35.
- Fluoride was qualified J- in the following samples because of a low recovery: DJ-38, DJ-2, DJ-33, HS-2, HS-3, DJ-46, DJ-45, DJ-44, DJ-12R, DJ-43, DJ-37, DJ-36, DJ-40, and DJ-35.
- Fluoride was qualified UJ in samples DJ-3 and DJ-47 because of a low recovery.
- Sulfate was qualified J- in the following samples because of a low recovery: DJ-38, DJ-3, DJ-2, DJ-33, HS-2, HS-3, DJ-46, DJ-45, DJ-44, DJ-12R, DJ-43, DJ-37, DJ-36, and DJ-40.
- Sulfate was qualified UJ in samples DJ-47 and DJ-35 because of a low recovery.

No further qualifications were required.

Attachment C:

Statistical Analysis

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This appendix contains a statistical analysis of the data collected from the groundwater monitoring wells associated with the Ash Pond at the Dave Johnston Power Plant in Glenrock, Wyoming. Methods used to compare upgradient with downgradient wells vary depending on the characteristics of the upgradient well data. Upgradient well data were analyzed for outliers, normality, non-detects, and other characteristics that affect the comparison measures. A comprehensive statistical analysis is presented in along with a discussion of the methods used to compare upgradient with downgradient water quality.

2.0 PRELIMINARY DATA ANALYSIS

The primary purpose of this statistical analysis was to establish background values from the upgradient well data, and compare these to the downgradient well data to determine if the downgradient water quality has been impacted by the Ash Pond. Familiarity with numerical and distributional characteristics of the upgradient wells aid in computing appropriate limits and in correctly interpreting those limits. This section contains a statistical summary of the upgradient well data. It is essential to understand the statistical characteristics of the data, prior to making the upgradient / downgradient well comparison. This understanding helps to ensure the appropriate calculations have been done and comparisons are completed using the proper statistical measures. The mean, standard deviation, quartiles, and other statistical quantities and corresponding graphs are presented in the following sections.

2.1 Data Analysis Techniques

The following sections summarize the statistical tools and techniques, used to evaluate upgradient well data from the Ash Pond.

2.1.1 Mean

One measure of primary interest is the center of the data. The average ($\overline{x}$), or the mean, is the most commonly used measure of the central tendency of the data. However, it can be heavily influenced by outliers and by asymmetric data. The mean is calculated using Equation (1):

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad (1)$$

Where:

$\overline{x}$ = mean

n = number of observations

x_i = i^{th} observation.

2.1.2 Standard Deviation

Another quantity of interest is the spread of the data. The standard deviation (s) is the most commonly used measure of spread, as it is easy to interpret and is used in many other statistical methods. Because it is calculated using the average, it is also sensitive to outliers and affected by data that are not symmetric. The standard deviation is calculated using Equation (2):

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \quad (2)$$

Where:

s = standard deviation

n = number of observations

x_i = i^{th} observation

$\bar{x}$ = mean of the observations.

2.1.3 Coefficient of Variance

The coefficient of variance (CV) is a relative measure of variation in the sample data which expresses the standard deviation relative to the mean. The CV is expressed as a percentage and provides a direct comparison to the standard deviations of two different data sets. It is important to note the mean of the data may be very close to or very far away from zero and the spread may be independent of the distance from the mean to zero. Therefore, no firm guidelines have been established for interpreting the CV. The CV was calculated for each detected analyte in each data grouping using Equation (3):

$$CV = \frac{s}{\bar{X}} \times 100\% \quad (3)$$

Where:

s = standard deviation

$\bar{X}$ = mean of the observations

2.1.4 Quartiles and the Five Number Summary

The five-number summary is a set of five numbers that are used to assess the spread of the data. It consists of the minimum value, first quartile, median, third quartile, and maximum of the data value. The first quartile is the 25th percentile of the data, the median is the 50th percentile of the data, and the third quartile is the 75th percentile of the data. The 25th percentile of the data is the

number such that 25% of the data are less than that number and 75% of the data are above the 25th percentile. The median and third quartiles are found in a similar manner.

2.2 Visual Tools

It is difficult to review numerical summary statistics and identify the degree of symmetry or normality of data without the aid of visual tools. In completing the statistical analysis for the Ash Pond, histograms and normal-quantile plots were developed for each of the analytes with at least on detectable observation. All graphs were developed using the R Statistical Package (R Core Team 2018).

2.2.1 Histograms

Histograms display the distribution and symmetry of the data. The data are displayed in such a way, that deviations from a normal (i.e., bell shaped) distribution can easily be observed. Outliers are also often identifiable in a histogram. Histograms for the upgradient wells were generated using both non-detects and detected results. The method detection limit (MDL) is plotted on the histogram for non-detect observations. A line was added to the histograms presenting non-detect values to show the location of the MDL on the graph. Figure C.1 below is a histogram of fluoride data for the upgradient wells for the Ash Pond. It is provided here to illustrate data distribution using a histogram. All of the histograms used to examine the analytes from Ash Pond upgradient well data, are provided in at the end of this appendix in Figure C.3.

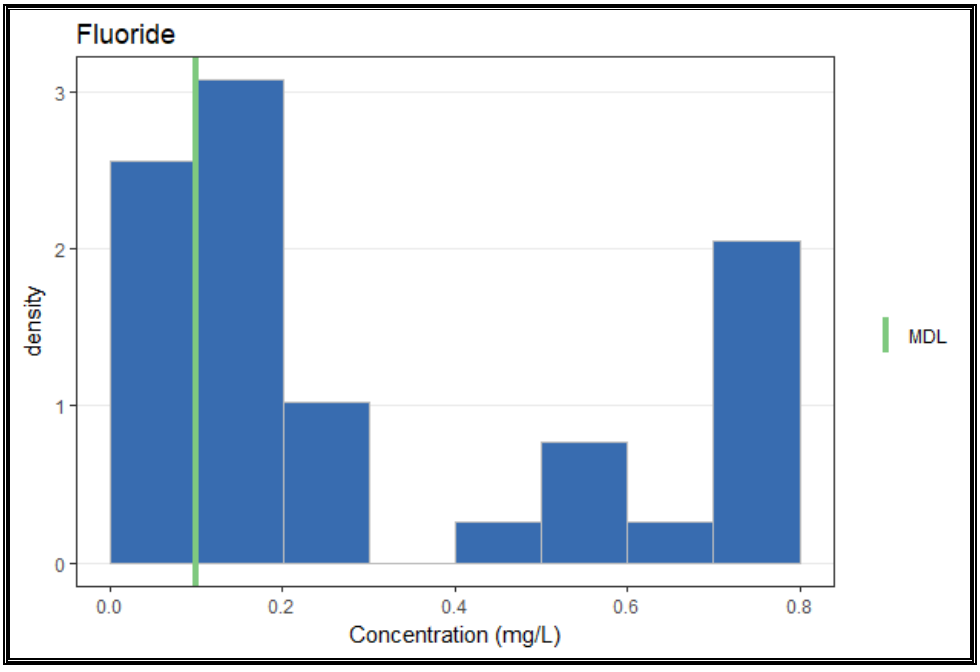

Figure C.1. Histogram of fluoride data from Ash Pond upgradient wells.

2.2.2 Normal-Quantile Plots

A normal-quantile plot is a graphical tool used to determine if the data follow a normal distribution and to look for outliers. When the data follow a normal distribution, the points on the graph lie along a straight line. Any deviations from a straight line are indicative of deviations from normality. It is important to note that no real-world data set is perfectly normal, so a certain amount of deviation from the line is to be expected even in data that are sufficiently normal to perform normality based statistics. Normal-quantile plots in this document were generated using both non-detects and detected values. The MDL was used to plot a non-detected value. Detected values are denoted by solid circles and non-detected values are identified by hollow circles. The gray area shows the region of acceptable deviations from normality. Figure C.2 uses the same fluoride data points used to develop the Figure C.1. Several of the points fall outside of the gray region. This indicates that the data are not normally distributed. All of the normal-quantile plots used to examine Ash Pond upgradient well data are provided at the end of this appendix in Figure C.3.

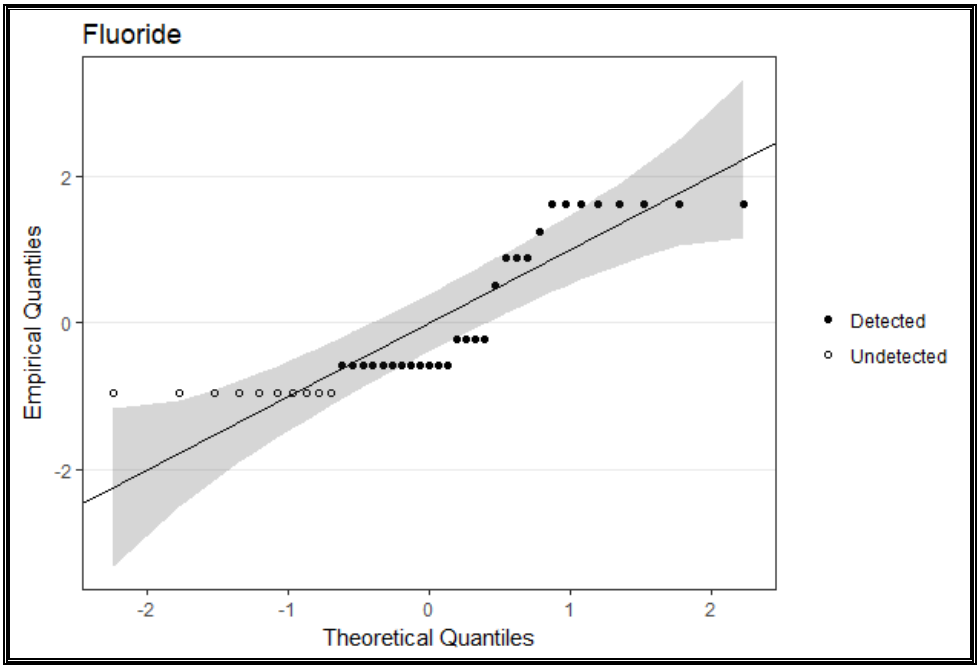

Figure C.2. Normal quantile plot of fluoride data from Ash Pond upgradient wells

2.2.3 Outliers

Outliers are data points that are notably larger or smaller than the rest of the data set and may indicate a problem with the data point or the data set as a whole. Examples which may be indicative of outliers include: 1) a misreported or erroneous concentration, 2) analytical error(s), or 3) natural variations in groundwater concentrations. Outliers are generally not omitted from project data simply because they are outliers. Rather, the result is examined individually or by project, to ensure the outlier does not represent an erroneous result or another concern warranting either additional sampling or omission of the outlier from the data analysis. There are reasonable

situations when it is appropriate to remove outliers. For example, if outliers which represent exceedingly low concentrations are used to compute background concentrations, they may result in background levels which are too conservative. Conversely, use of excessively high outlier concentrations to compute background values, may result in an overestimation of background concentrations resulting in false-negative comparisons for downgradient groundwater quality. Outliers were detected in the arsenic, barium, and beryllium upgradient data. However, none of the outliers were large enough to warrant exclusion from analysis.

2.2.4 Treatment of Non-Detects

Non-detect values are common in environmental data. When present in data sets, non-detects produce difficulties in computing statistical metrics because reliable values cannot be assigned. Substituting a value such as the MDL or one-half of the MDL for non-detects is a common practice. However, use of the detection limit, or one-half of the detection limit, can produce unstable or unreliable results (EPA 2009). Statistical methods, such as Kaplan-Meier (Helsel 2004), can be used to appropriately evaluate data sets containing significant quantities of non-detects, by producing estimates of the survival probability function for non-detects. These estimates can then be used to compute summary statistics on the data set. However, Kaplan-Meier does not perform well if more than 50% of the results are non-detects or if fewer than eight detections are available for evaluation. The arsenic, beryllium, cadmium, chromium, cobalt, lithium, and selenium upgradient data have more than 50% non-detects. Thus, statistical analysis was not done for these analytes. Antimony, mercury, and thallium were not detected in any upgradient samples and were also not analyzed. The barium, fluoride, lead, molybdenum, and radium data contain non-detects, but more than half of the observations are detects. As a result, Kaplan-Meier was used to compute means, standard deviations, and statistical limits used to compare the upgradient downgradient water quality for barium, fluoride, lead, molybdenum, and radium.

2.3 Summary Results

Table C.1 provides summary statistics for Ash Pond upgradient well data. Although the data from the upgradient wells were combined when compared to the downgradient wells, the summary statistics presented in this section are separated by well and are presented as pooled data. The data are presented in this way, due to observed differences between the different wells for many of the analytes. These tables in conjunction with the histograms and normal-quantile plots, provide information about differences between wells and the data properties of the combined data. Analytes that were not detected in any upgradient samples are not listed in Table C.1.

Table C.1. Summary statistics for the Ash Pond upgradient wells

Analyte	Well	Number of Samples	Samples Detected	Median (mg/L)	Mean (mg/L)	Standard Deviation (mg/L)	Coefficient of Variation (%)
Arsenic	DJ-2	12	2	NA	NA	NA	NA
Arsenic	DJ-3	11	3	NA	NA	NA	NA
Arsenic	DJ-37	10	4	NA	NA	NA	NA
Arsenic	DJ-38	10	5	<0.001	0.001	0.001	39%
Arsenic	Pooled	43	14	NA	NA	NA	NA
Barium	DJ-2	12	12	0.07	0.07	0.01	17%
Barium	DJ-3	11	11	0.14	0.25	0.32	130%
Barium	DJ-37	10	1	NA	NA	NA	NA
Barium	DJ-38	10	6	0.06	0.08	0.04	54%
Barium	Pooled	43	30	0.07	0.12	0.18	152%
Beryllium	DJ-2	12	0	NA	NA	NA	NA
Beryllium	DJ-3	11	1	NA	NA	NA	NA
Beryllium	DJ-37	10	0	NA	NA	NA	NA
Beryllium	DJ-38	10	0	NA	NA	NA	NA
Beryllium	Pooled	43	1	NA	NA	NA	NA
Cadmium	DJ-2	12	0	NA	NA	NA	NA
Cadmium	DJ-3	11	0	NA	NA	NA	NA
Cadmium	DJ-37	10	7	0.002	0.002	0.0003	15%
Cadmium	DJ-38	10	1	NA	NA	NA	NA
Cadmium	Pooled	43	8	NA	NA	NA	NA
Chromium	DJ-2	12	1	NA	NA	NA	NA
Chromium	DJ-3	11	4	NA	NA	NA	NA
Chromium	DJ-37	10	0	NA	NA	NA	NA
Chromium	DJ-38	10	3	NA	NA	NA	NA
Chromium	Pooled	43	8	NA	NA	NA	NA
Cobalt	DJ-2	12	0	NA	NA	NA	NA
Cobalt	DJ-3	11	1	NA	NA	NA	NA
Cobalt	DJ-37	10	9	0.0605	0.059	0.042	72%
Cobalt	DJ-38	10	0	NA	NA	NA	NA
Cobalt	Pooled	43	10	NA	NA	NA	NA
Fluoride	DJ-2	11	11	0.2	0.2	0.03	14%
Fluoride	DJ-3	10	0	NA	NA	NA	NA
Fluoride	DJ-37	9	9	0.7	0.7	0.1	17%
Fluoride	DJ-38	9	9	0.3	0.5	0.3	57%
Fluoride	Pooled	39	29	0.2	0.4	0.3	66%

Analyte	Well	Number of Samples	Samples Detected	Median (mg/L)	Mean (mg/L)	Standard Deviation (mg/L)	Coefficient of Variation (%)
Lead	DJ-2	12	4	NA	NA	NA	NA
Lead	DJ-3	11	8	0.003	0.009	0.017	198%
Lead	DJ-37	10	7	0.005	0.006	0.003	52%
Lead	DJ-38	10	5	<0.001	0.003	0.003	102%
Lead	Pooled	43	24	0.002	0.004	0.009	213%
Lithium	DJ-2	12	0	NA	NA	NA	NA
Lithium	DJ-3	11	0	NA	NA	NA	NA
Lithium	DJ-37	10	0	NA	NA	NA	NA
Lithium	DJ-38	10	2	NA	NA	NA	NA
Lithium	Pooled	43	2	NA	NA	NA	NA
Molybdenum	DJ-2	12	10	0.001	0.001	0.001	37%
Molybdenum	DJ-3	11	8	0.001	0.001	0.0004	35%
Molybdenum	DJ-37	10	10	0.029	0.027	0.014	52%
Molybdenum	DJ-38	10	10	0.005	0.005	0.002	43%
Molybdenum	Pooled	43	38	0.002	0.008	0.012	153%
Radium	DJ-2	11	7	1.3	2.0	1.2	61%
Radium	DJ-3	11	9	2.1	2.7	1.9	70%
Radium	DJ-37	10	10	2.3	2.3	0.7	33%
Radium	DJ-38	10	8	2.35	2.6	1.0	37%
Radium	Pooled	42	34	2.25	2.4	1.3	56%
Selenium	DJ-2	12	0	NA	NA	NA	NA
Selenium	DJ-3	11	3	NA	NA	NA	NA
Selenium	DJ-37	10	2	NA	NA	NA	NA
Selenium	DJ-38	10	10	0.005	0.006	0.002	40%
Selenium	Pooled	43	15	NA	NA	NA	NA

Table C.2 provides the five-number summaries for the Ash Pond upgradient wells. As with the summary statistics, a five-number summary was computed for each well as well as for the pooled data. If a minimum or a quartile falls within the range of non-detects it is denoted using a less-than (<) symbol. Analytes that were not detected in any upgradient samples are not listed in Table C.2.

Table C.2. Five-number summary for the Ash Pond upgradient wells.

Analyte	Well	Minimum (mg/L)	First Quartile (mg/L)	Median (mg/L)	Third Quartile (mg/L)	Maximum (mg/L)
Arsenic	DJ-2	<0.001	<0.001	<0.001	<0.001	0.002
Arsenic	DJ-3	<0.001	<0.001	<0.001	0.001	0.012
Arsenic	DJ-37	<0.001	<0.001	<0.001	0.002	0.002
Arsenic	DJ-38	<0.001	<0.001	<0.001	0.002	0.002
Arsenic	Pooled	<0.001	<0.001	<0.001	0.001	0.012
Barium	DJ-2	0.06	0.06	0.07	0.085	0.09
Barium	DJ-3	0.09	0.115	0.14	0.21	1.2
Barium	DJ-37	<0.05	<0.05	<0.05	<0.05	0.07
Barium	DJ-38	<0.05	<0.05	0.06	0.09	0.19
Barium	Pooled	<0.05	<0.05	0.07	0.1	1.2
Beryllium	DJ-2	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	DJ-3	<0.001	<0.001	<0.001	<0.001	0.004
Beryllium	DJ-37	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	DJ-38	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	Pooled	<0.001	<0.001	<0.001	<0.001	0.004
Cadmium	DJ-2	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	DJ-3	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	DJ-37	<0.001	<0.001	0.002	0.002	0.003
Cadmium	DJ-38	<0.001	<0.001	<0.001	<0.001	0.003
Cadmium	Pooled	<0.001	<0.001	<0.001	<0.001	0.003
Chromium	DJ-2	<0.001	<0.005	<0.005	<0.005	0.005
Chromium	DJ-3	<0.001	<0.005	<0.005	0.0065	0.056
Chromium	DJ-37	<0.001	<0.005	<0.005	<0.005	<0.005
Chromium	DJ-38	<0.001	<0.005	<0.005	0.005	0.009
Chromium	Pooled	<0.001	<0.005	<0.005	<0.005	0.056
Cobalt	DJ-2	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	DJ-3	<0.005	<0.005	<0.005	<0.005	0.03
Cobalt	DJ-37	<0.005	0.013	0.0605	0.096	0.118
Cobalt	DJ-38	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	Pooled	<0.005	<0.005	<0.005	<0.005	0.118
Fluoride	DJ-2	0.2	0.2	0.2	0.2	0.3
Fluoride	DJ-3	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride	DJ-37	0.5	0.6	0.7	0.8	0.8
Fluoride	DJ-38	0.2	0.3	0.3	0.8	0.8
Fluoride	Pooled	<0.1	<0.15	0.2	0.6	0.8
Lead	DJ-2	<0.001	<0.001	<0.001	0.0015	0.002

Analyte	Well	Minimum (mg/L)	First Quartile (mg/L)	Median (mg/L)	Third Quartile (mg/L)	Maximum (mg/L)
Lead	DJ-3	<0.001	<0.0015	0.003	0.006	0.06
Lead	DJ-37	<0.001	<0.001	0.005	0.009	0.01
Lead	DJ-38	<0.001	<0.001	<0.001	0.004	0.008
Lead	Pooled	<0.001	<0.001	0.002	0.0045	0.06
Lithium	DJ-2	<0.1	<0.1	<0.1	<0.1	<0.1
Lithium	DJ-3	<0.1	<0.1	<0.1	<0.1	<0.1
Lithium	DJ-37	<0.1	<0.1	<0.1	<0.1	<0.1
Lithium	DJ-38	<0.1	<0.1	<0.1	<0.1	0.1
Lithium	Pooled	<0.1	<0.1	<0.1	<0.1	0.1
Molybdenum	DJ-2	<0.001	0.001	0.001	0.002	0.002
Molybdenum	DJ-3	<0.001	<0.001	0.001	0.001	0.002
Molybdenum	DJ-37	0.007	0.013	0.029	0.037	0.045
Molybdenum	DJ-38	0.003	0.003	0.0045	0.007	0.009
Molybdenum	Pooled	<0.001	0.001	0.002	0.007	0.045
Radium	DJ-2	<0.6	<1.15	2.2	2.65	4.2
Radium	DJ-3	<0.5	1.55	2.1	2.95	8
Radium	DJ-37	1	2.1	2.3	2.7	3.6
Radium	DJ-38	<0.04	1.8	2.35	3.2	4.4
Radium	Pooled	<0.04	1.4	2.25	2.9	8
Selenium	DJ-2	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	DJ-3	<0.001	<0.001	<0.001	0.001	0.001
Selenium	DJ-37	<0.001	<0.001	<0.001	<0.001	0.001
Selenium	DJ-38	0.003	0.004	0.005	0.007	0.01
Selenium	Pooled	<0.001	<0.001	<0.001	0.001	0.01

3.0 UPGRADIENT AND DOWNGRADIENT WELL COMPARISON

Groundwater quality was assessed using upper tolerance limits (UTLs) and the Maximum Contaminant Levels (MCL) for each of the Appendix III and IV analytes. The data measured from the upgradient/background wells, was used to compute a UTL, which serves as the background value. The larger of the UTL and MCL was used as the groundwater protection limit (GWPL). Data obtained from the downgradient wells were compared point-by-point to the GWPLs to determine if the site complies with the *Final Rule*. The software package Sanitas© v.2016, was used to compute the UTLs. As part of this evaluation, groundwater data were examined for characteristics that impact how the UTL was computed. These characteristics include the:

- Number of non-detect results

- Data distribution
- Site-wide false-positive rate (SWFPR)
- Spatial and seasonal variability.

Summary statistics and other statistical characteristics of the data are discussed in the previous section. These characteristics were used to compute the appropriate UTL for each analyte.

3.1 Groundwater Protection Limits

The shape or distribution of the data was assessed to ensure that the most appropriate UTL was used for comparison purposes. The most efficient UTL is a parametric UTL that assumes the data follow a normal distribution. If the data do not follow a normal distribution, a non-parametric UTL is typically used. Thus, the data for each analyte are assessed to determine if a parametric UTL can be computed from the data. The parametric UTL is computed using the formula below:

$$UTL = \bar{X} + \kappa \times S$$

Where:

$\bar{X}$ = the average of the background data
κ = multiplier from EPA Unified Guidance, March 2009
S = standard deviation of the background data

3.1.1 Normal Distribution

Histograms and normal-quantile plots were used to visually inspect the data for deviations from normality and to determine if outliers were present. This examination reveals the data does not contain outliers or analytes with more than 50% non-detects. The Shapiro-Wilk test was used to assess normality in conjunction with the normal quantile plots. If the p-value associated with the test was greater than or equal to 0.05, the data are considered normally distributed and a parametric UTL was computed using the upgradient measurements. If the p-value is less than 0.05, then the maximum detectable value was used as the UTL.

Note: The 0.05 p-value is not a hard and fast rule. Parametric UTLs were computed for analytes whose p-values were close to 0.05 as selected by the Sanitas software (Sanitas 2016).

If the data for an analyte were not normally distributed, the ladder of powers method was used to determine if a reasonable transformation existed that would produce normal data. The ladder of powers tests different monotonic transformations of the data, such as the natural logarithm or square, to see if the transformed data have a normal distribution. If a transformation within the ladder of powers can be found that produces normal data, a parametric UTL was computed using the transformed data. If a transformation was identified, it was applied to both upgradient / background and downgradient groundwater data prior to comparison.

A non-parametric UTL was computed for data that are not normally distributed and cannot be transformed. The non-parametric UTL is the largest value measured in the upgradient / background wells. Table C.3 summarizes the results of the Shapiro-Wilk test for each of the Appendix III and IV analytes where at least 50% of the measurements were detects. An

appropriate transformation was found for radium. Non-parametric UTLs were computed for all of the analytes except for radium.

Table C.3. Shapiro-Wilk Test for the Ash Pond upgradient wells.

Analyte	Well	W-Statistic	P-Value	Normal
Barium	Pooled	0.3345	<0.0001	Not Normal
Fluoride	Pooled	0.7771	<0.0001	Not Normal
Lead	Pooled	0.3509	<0.0001	Not Normal
Molybdenum	Pooled	0.6213	<0.0001	Not Normal
Radium	Pooled	0.8872	0.0006	Not Normal
Square Root of Radium	Pooled	0.9671	0.2637	Normal

3.1.2 Upper Tolerance Limits and Groundwater Protection Limit

This section contains the GWPL computed for each analyte. Table C.4 lists the UTL, MCL, and GWPL for each of the analytes detected in the upgradient wells. The following criteria was used for determining each GWPL:

- If more than 50% of the data were detected and have a normal distribution, a parametric UTL was computed.
- If the data were not normally distributed or more than 50% of the data were non-detects, the greater of the larger MDL and maximum detected value was used as the UTL.
- If all of the upgradient samples were non-detects, the largest MDL was used as the UTL.
- The larger of the MCL and the UTL was used as the GWPL.

Graphs were constructed for each of the analytes that had at least one detectable measurement in the downgradient wells. The graphs illustrate the GWPL as a horizontal line with the measurements from each of the downgradient wells plotted on the same graph. Non-detects are represented by hollow gray circles on the graphs. These graphs clearly depict how the downgradient measurements compare to the GWPL. Results above the GWPL line represent values exceeding the GWPL. As the graphs illustrate, the arsenic, cadmium, molybdenum, and radium data exceeded the GWPL. Table C.4 list the GWPLs and the wells that exceed for each analyte and list the downgradient wells that exceed the UTLs (Figure C.4). UTL plots are not shown for analytes with no downgradient detections.

Table C.4. Comparison of downgradient wells to the groundwater protection limit.

Analyte	Upper Tolerance Limit (mg/L)	Maximum Contaminant Level (mg/L)	Ground Water Protection Limit (mg/L)	Downgradient Wells that Exceed Upper Tolerance Limit
Antimony	0.001	0.006	0.006	Within Limit
Arsenic	0.012	0.01	0.012	DJ-35
Barium	1.2	2	2	Within Limit
Beryllium	0.004	0.004	0.004	Within Limit
Cadmium	0.00	0.005	0.005	DJ-36
Chromium	0.056	0.1	0.1	Within Limit
Cobalt	0.118	0.006	0.118	Within Limit
Fluoride	0.8	4	4	Within Limit
Lead	0.06	0.015	0.06	Within Limit
Lithium	0.1	0.040	0.1	Within Limit
Mercury	0.0	0.002	0.002	Within Limit
Molybdenum	0.045	0.100	0.100	DJ-33, DJ-35
Radium	6.8	5	6.822	DJ-36
Selenium	0.01	0.05	0.05	Within Limit
Thallium	0.0005	0.002	0.002	Within Limit

4.0 CONCLUSIONS

Data were collected from wells associated with the Ash Pond at the Dave Johnston Power Plant. A comprehensive data analysis was completed on the upgradient wells to ensure that comparisons between upgradient and downgradient wells were performed correctly. Arsenic, cadmium, molybdenum, pH, and radium exceeded the ground water protection standard in the downgradient wells for Ash Pond.

5.0 REFERENCES

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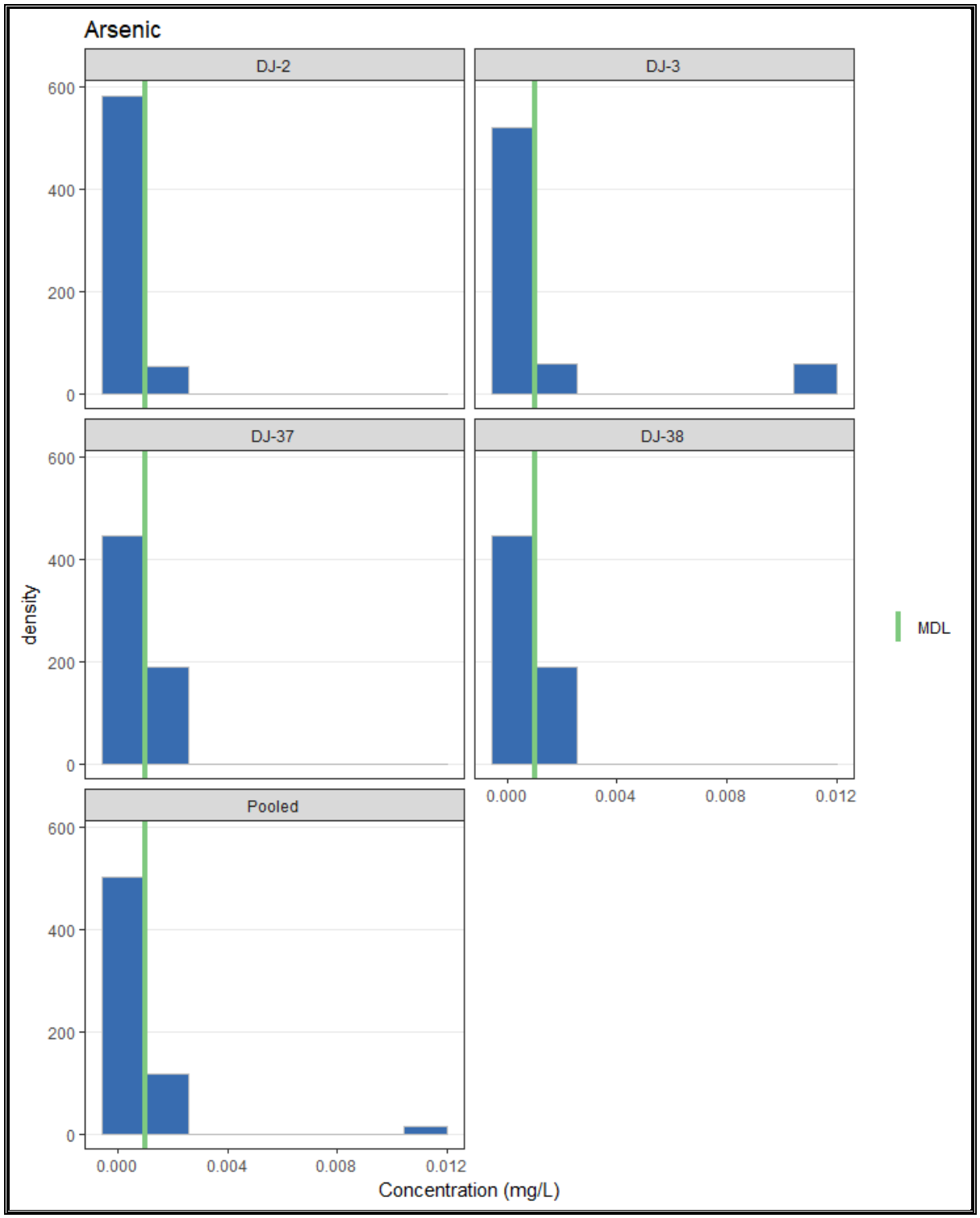
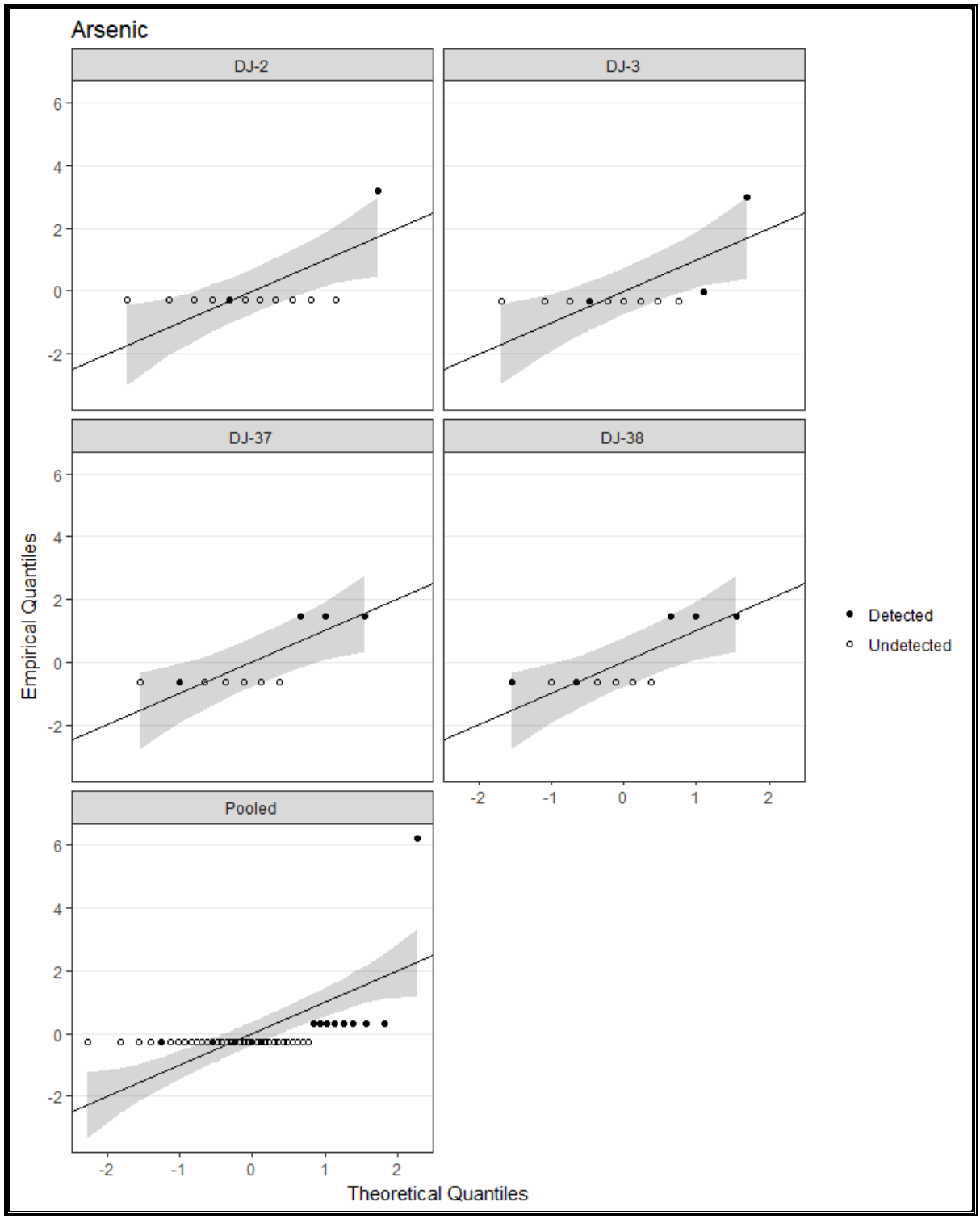


Figure C.3. Summary statistics plots for the Ash Pond.



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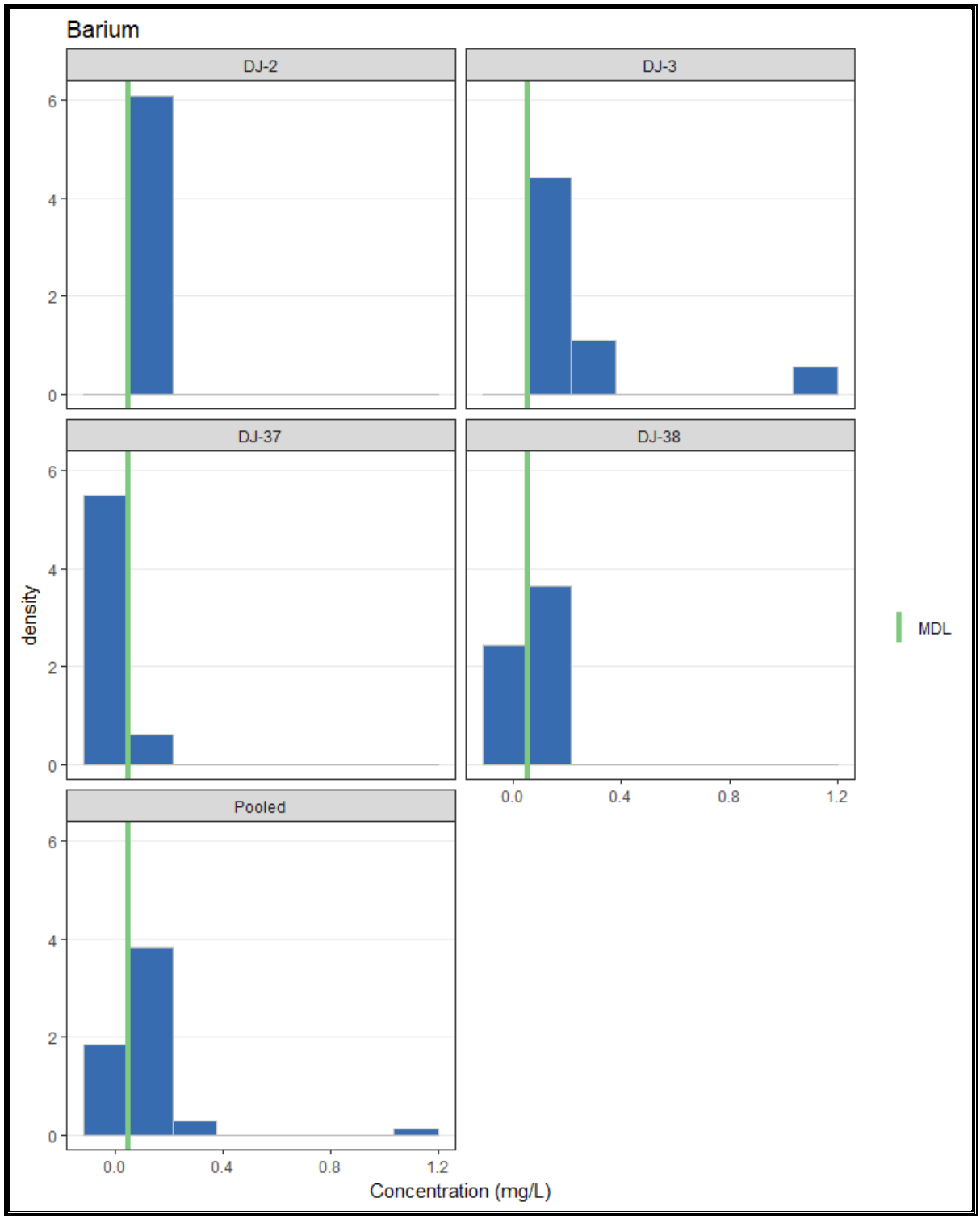

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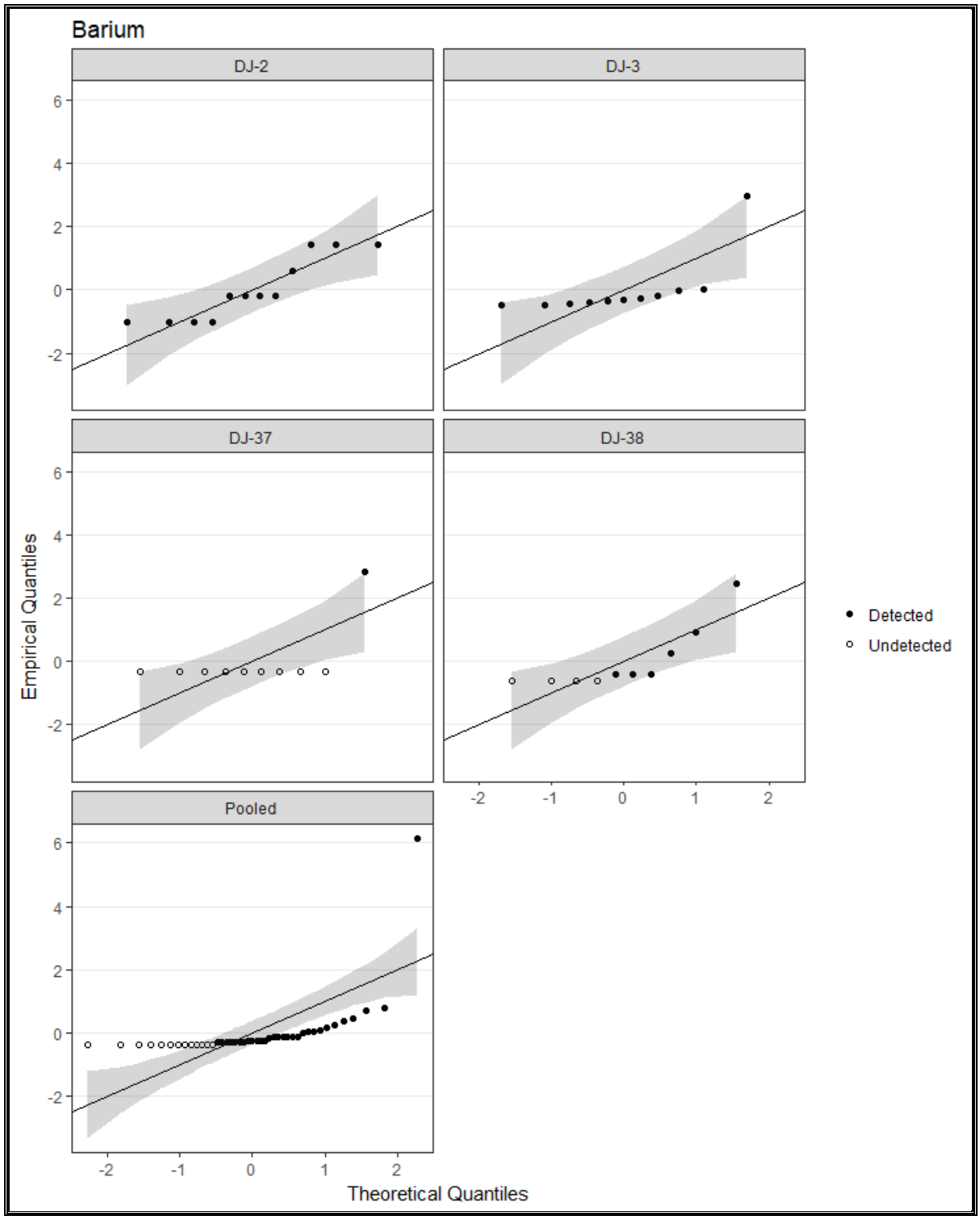
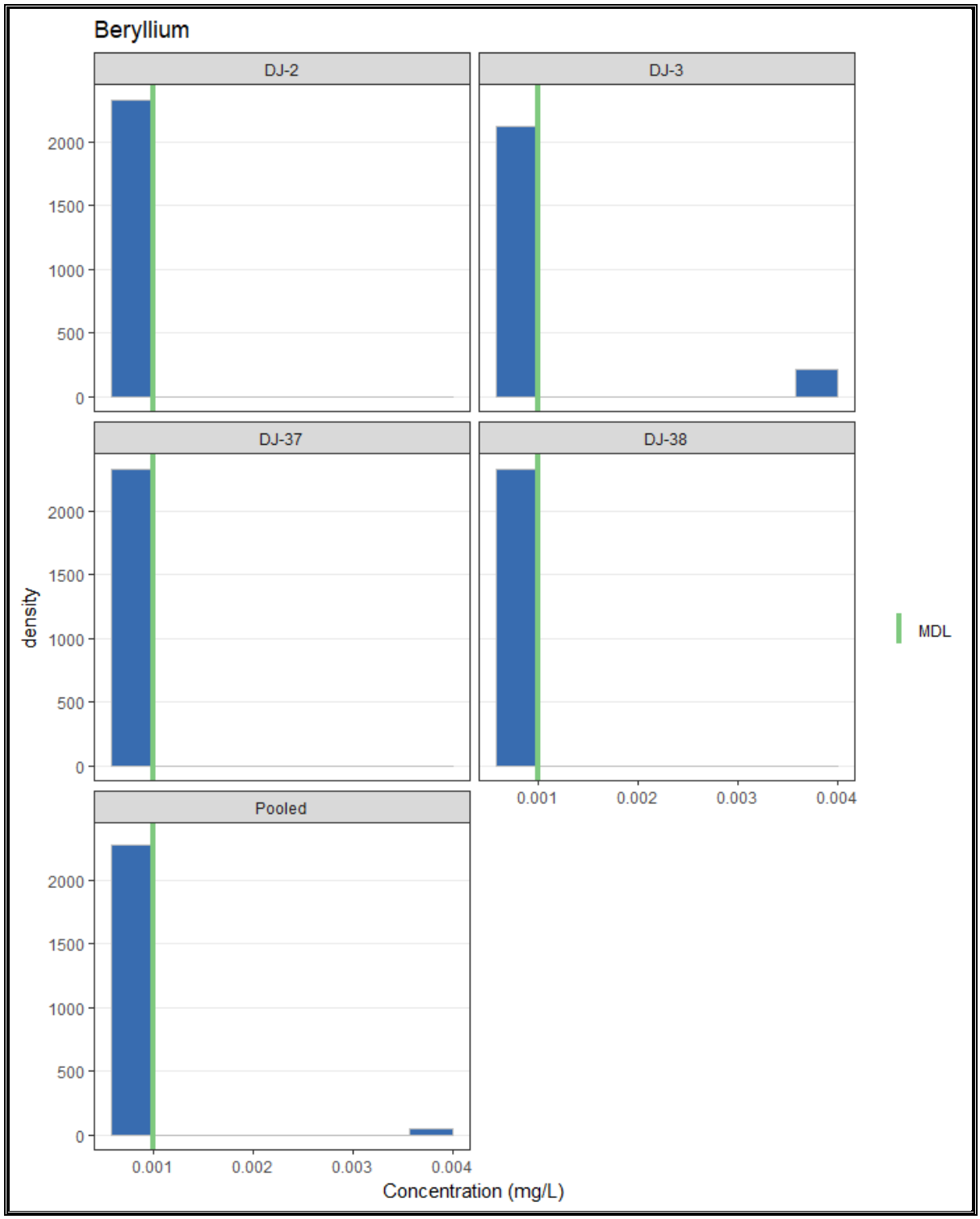


Figure C.3 (cont). Summary statistics plots for the Ash Pond.



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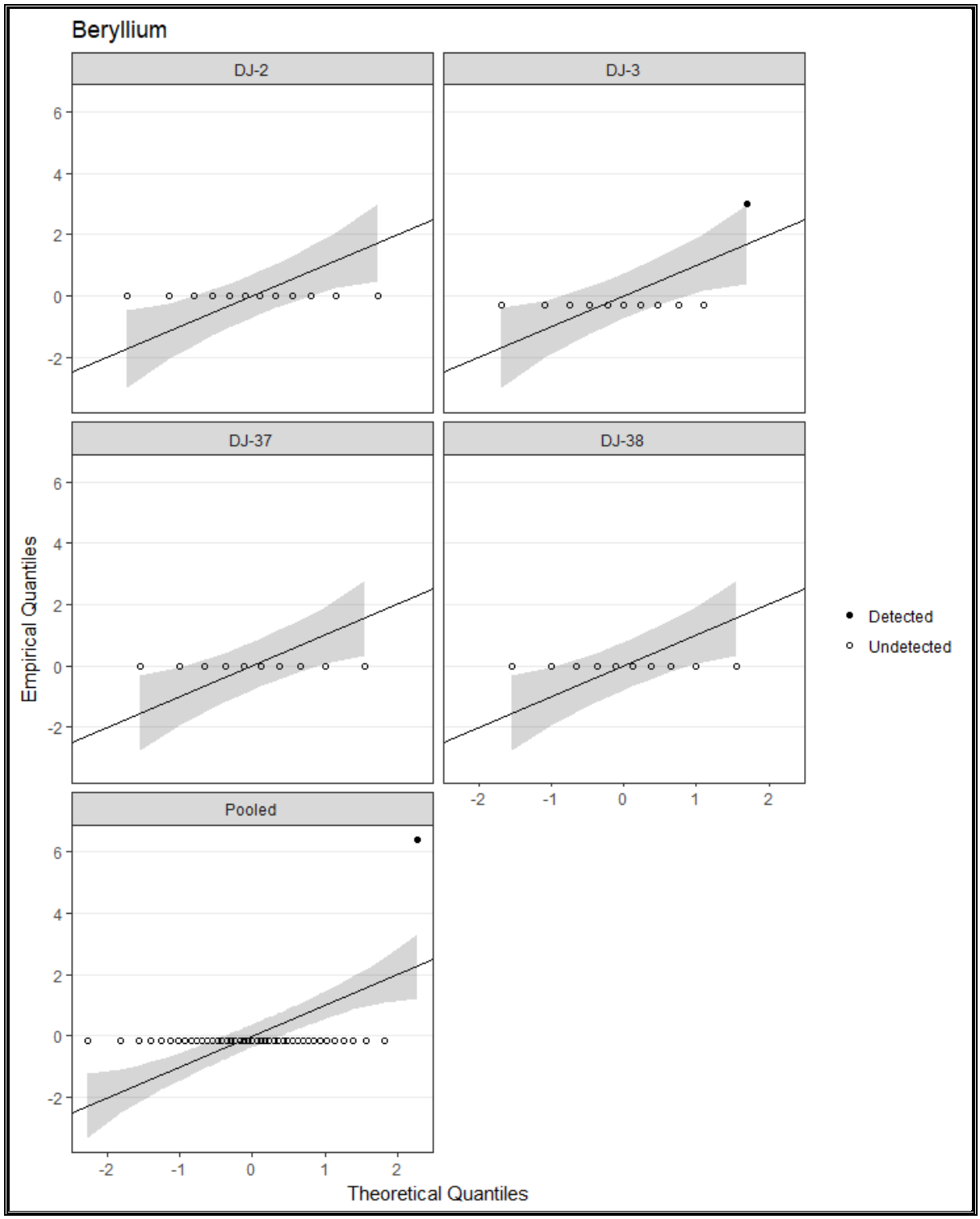

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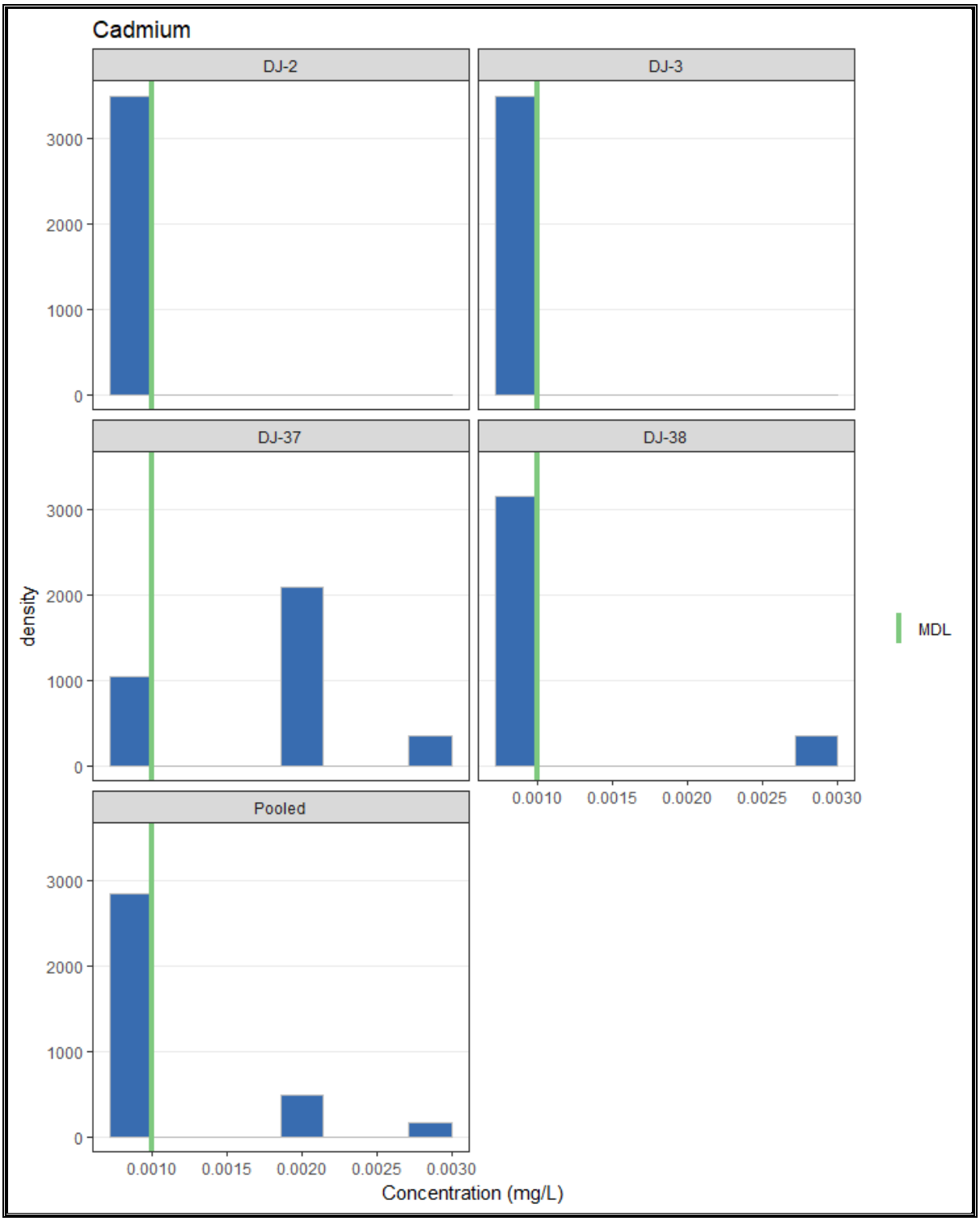

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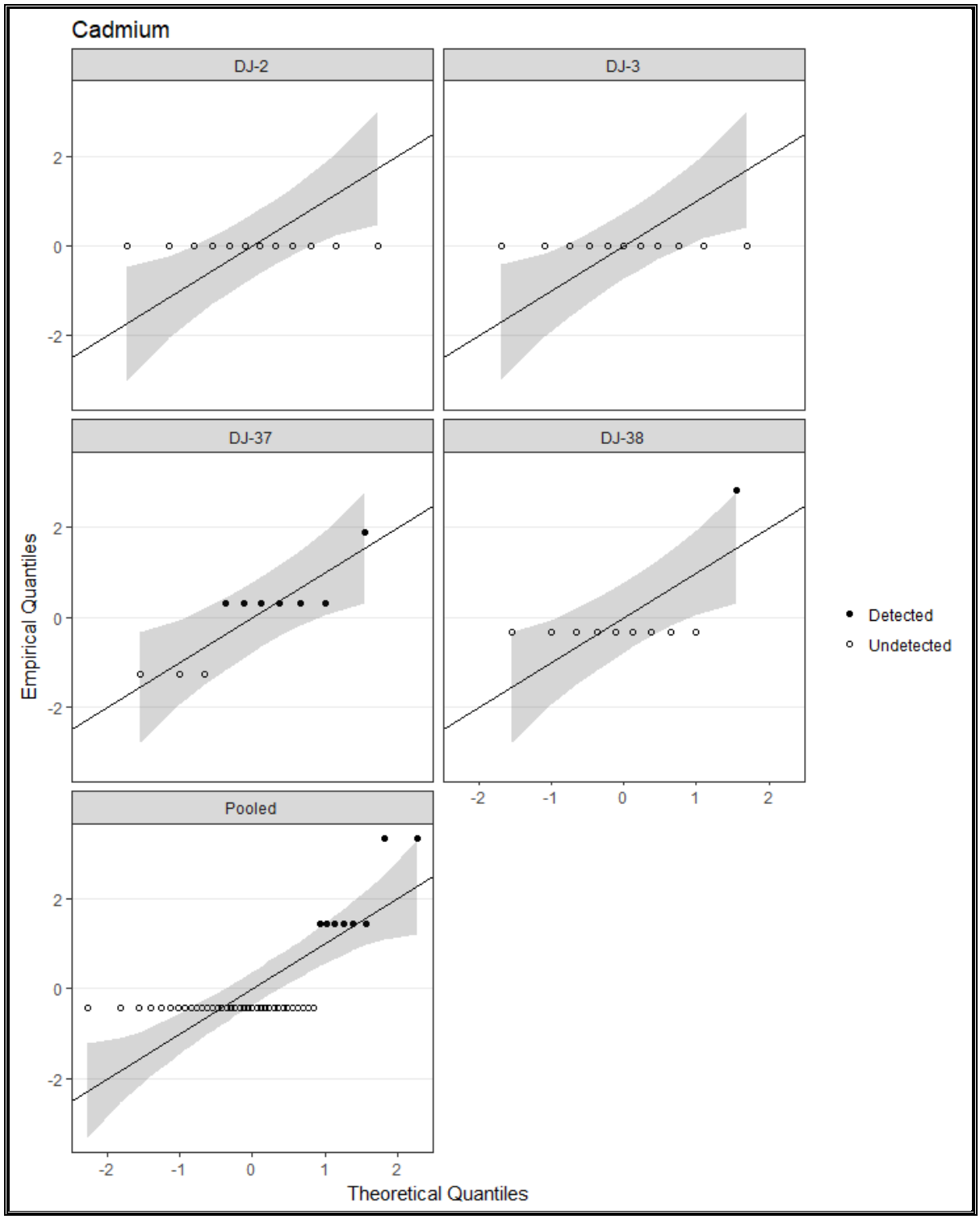

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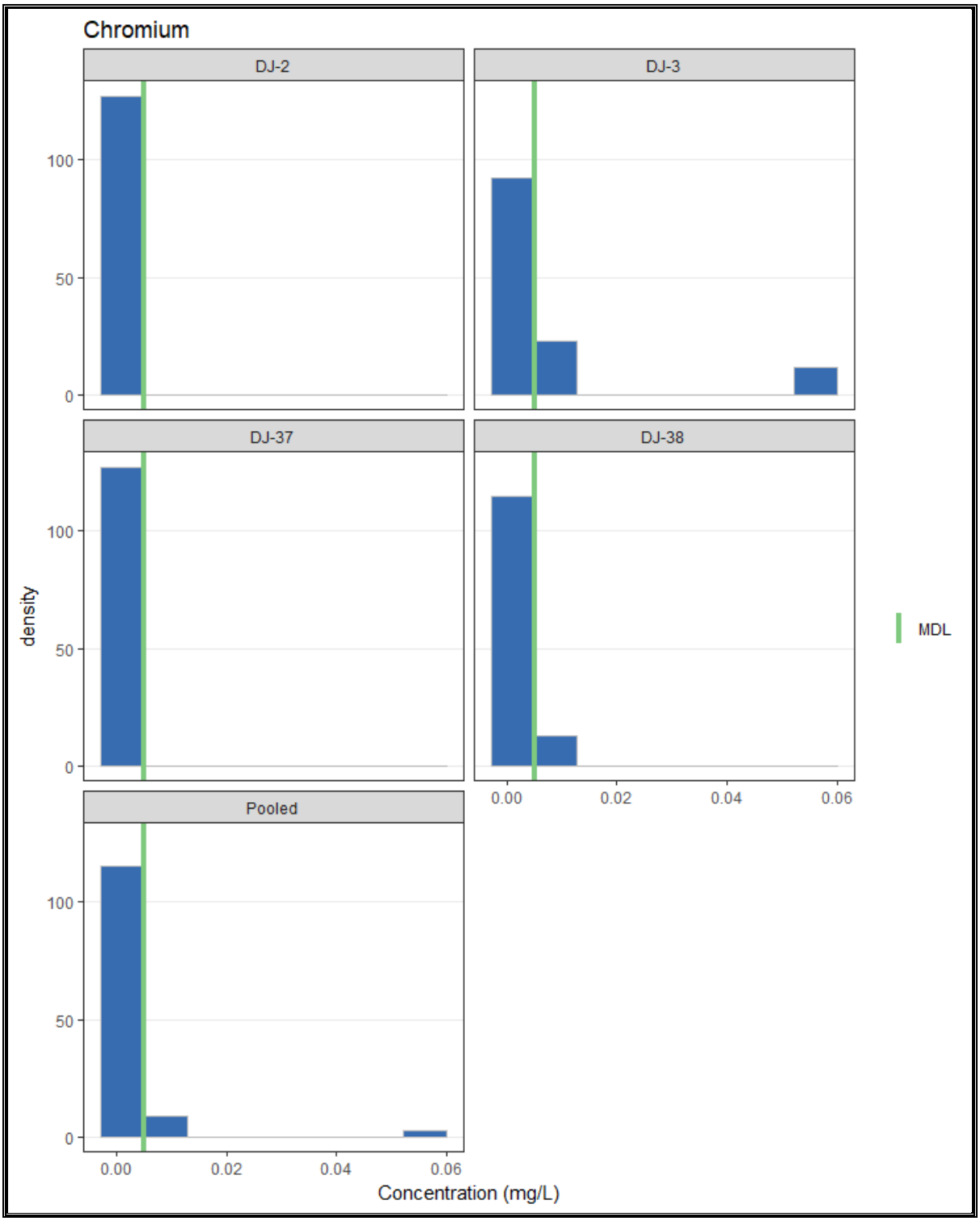

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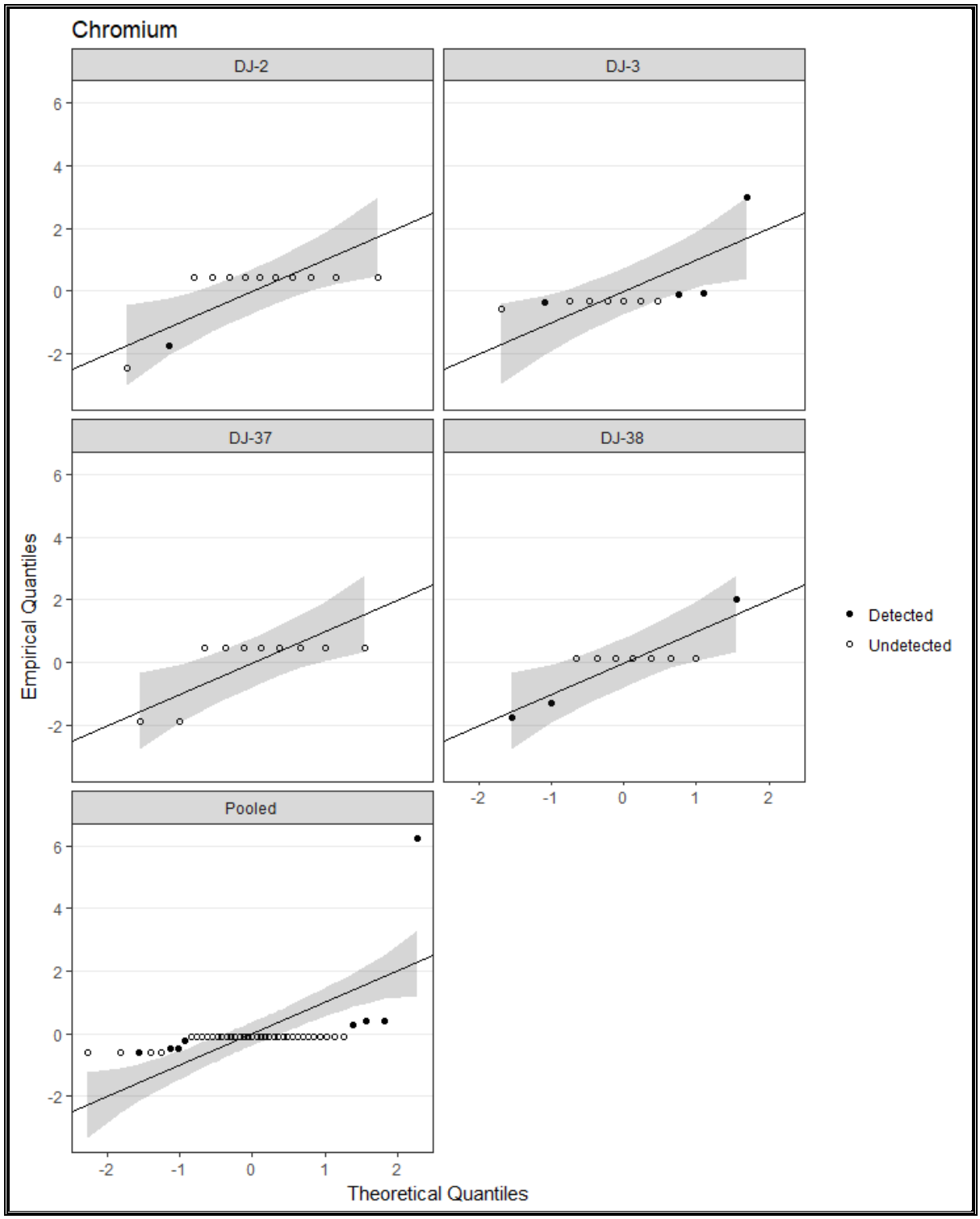

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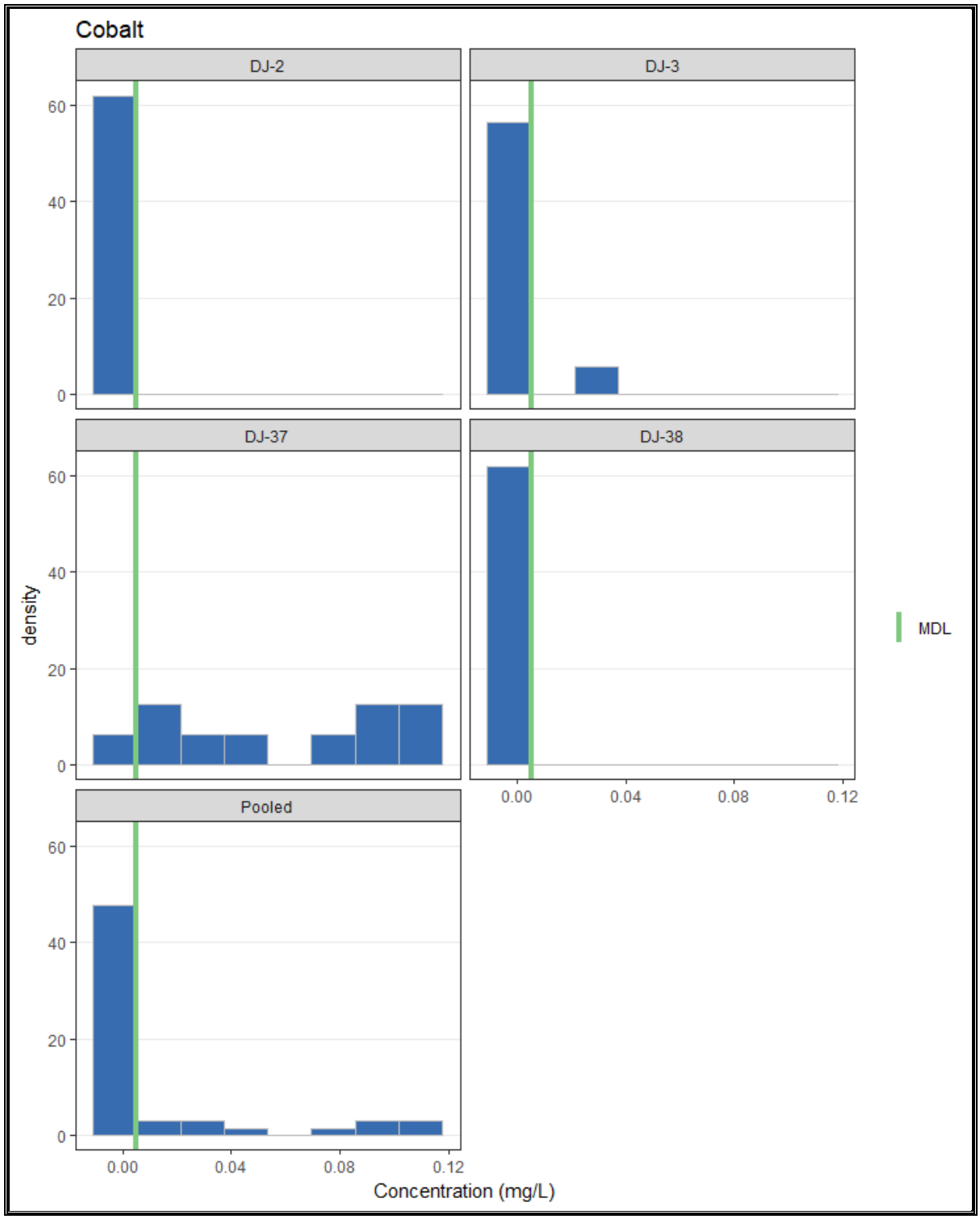

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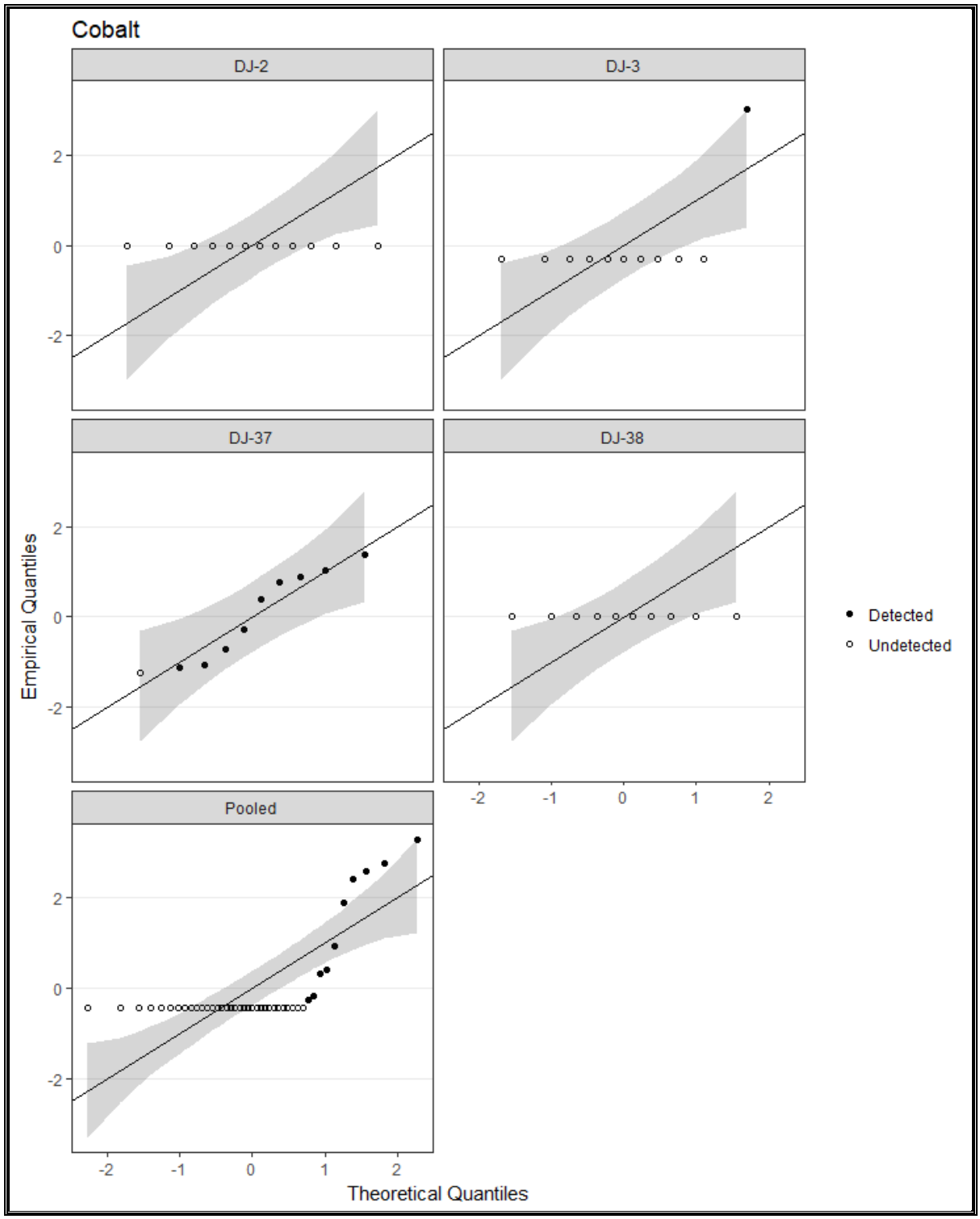

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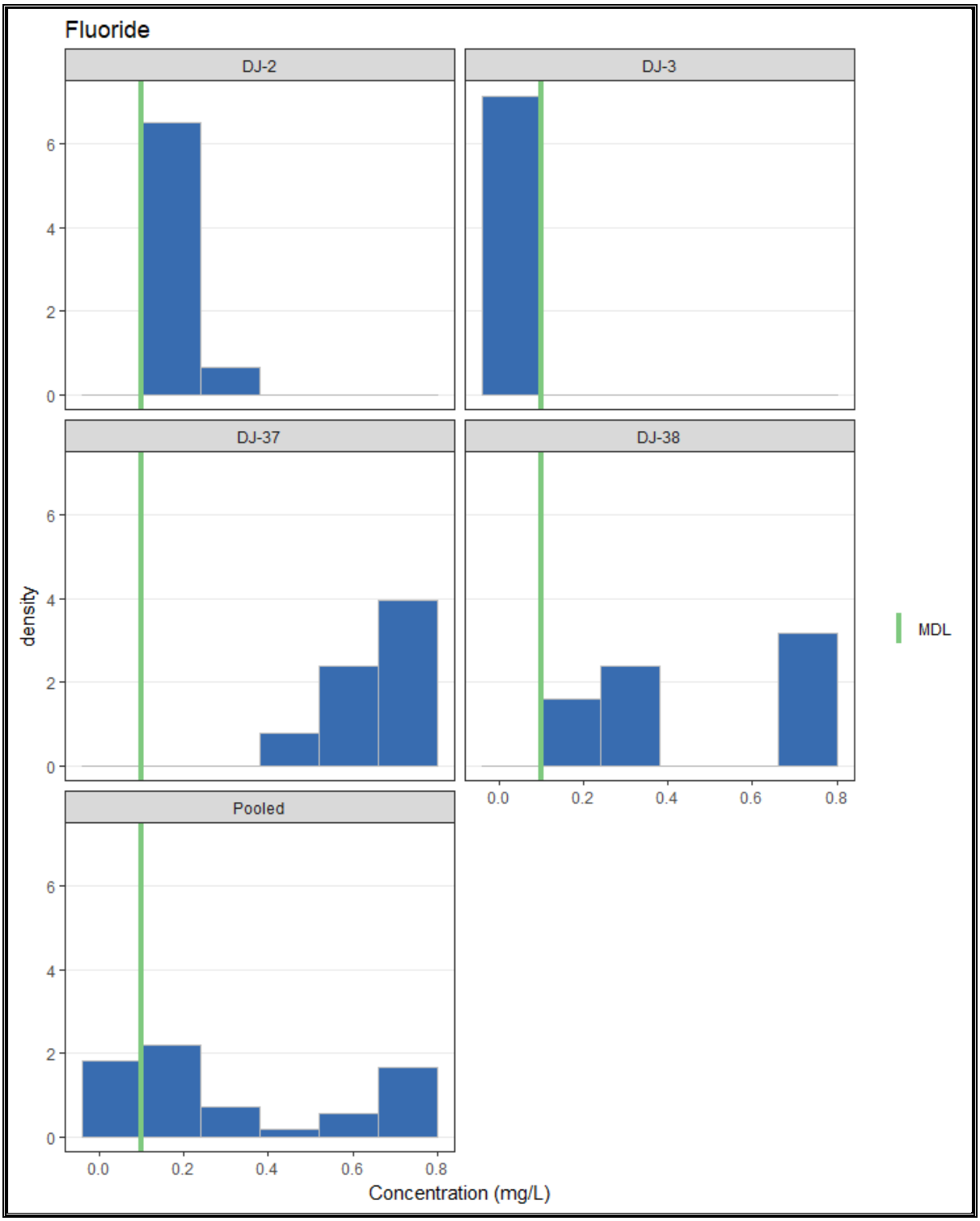

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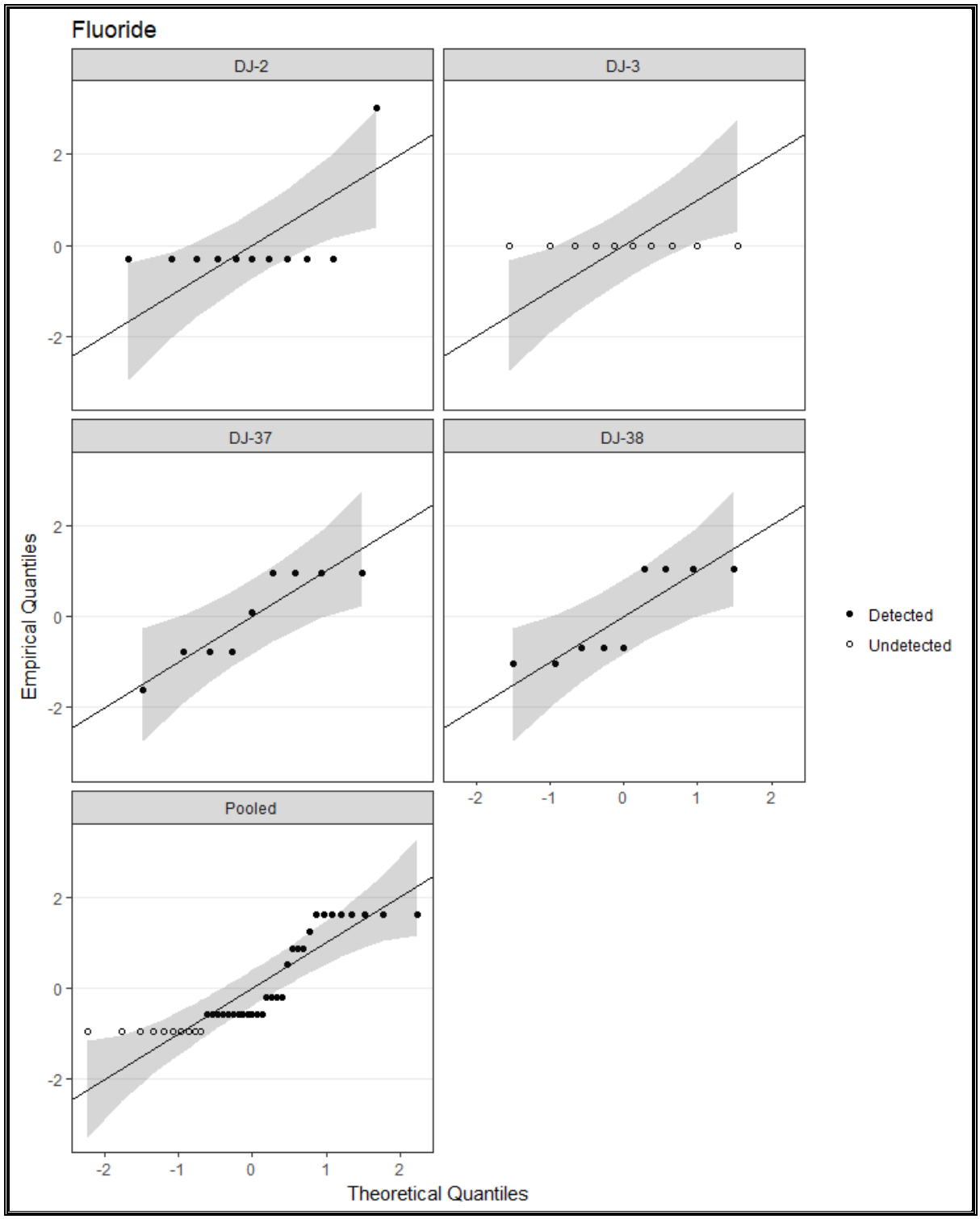

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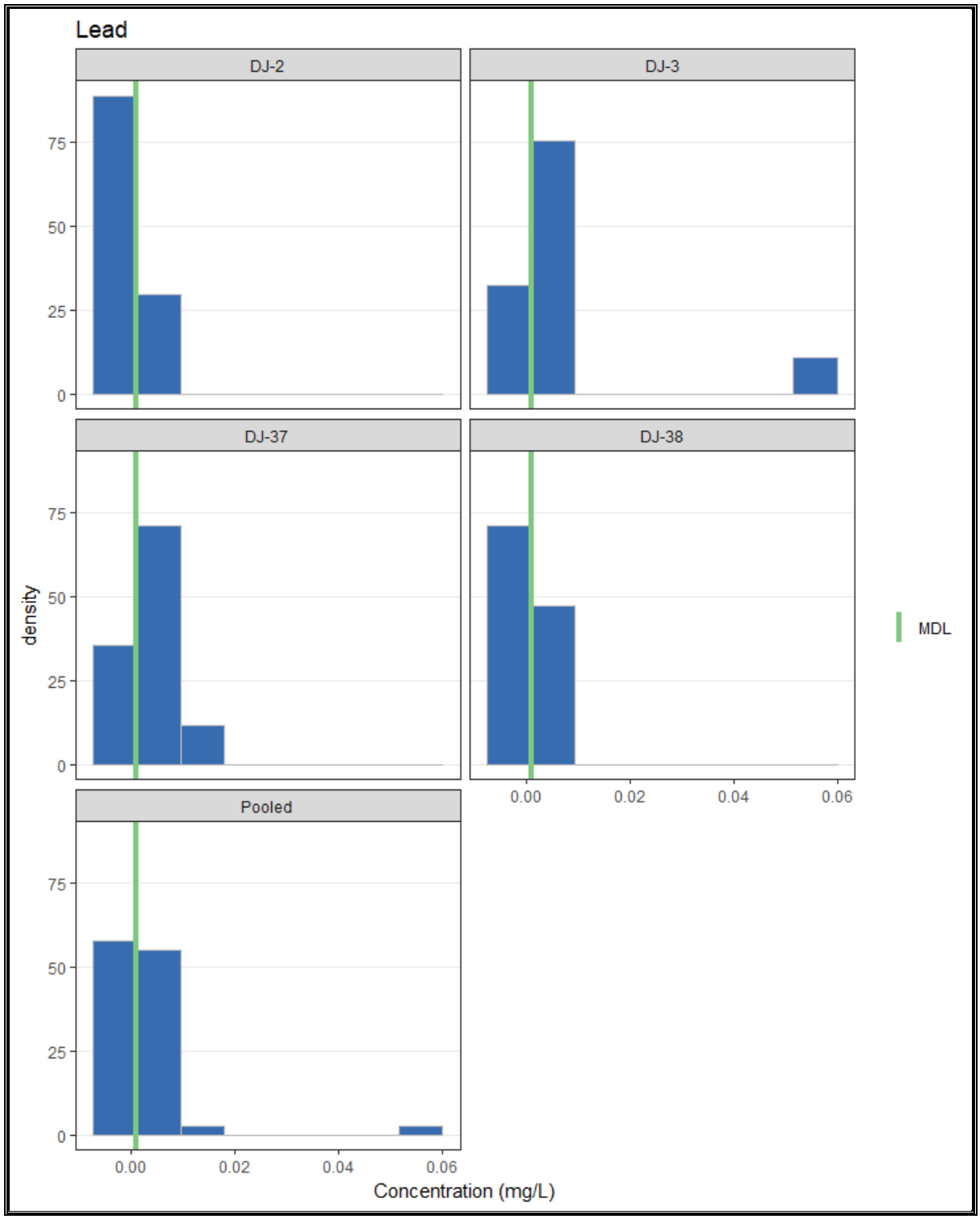

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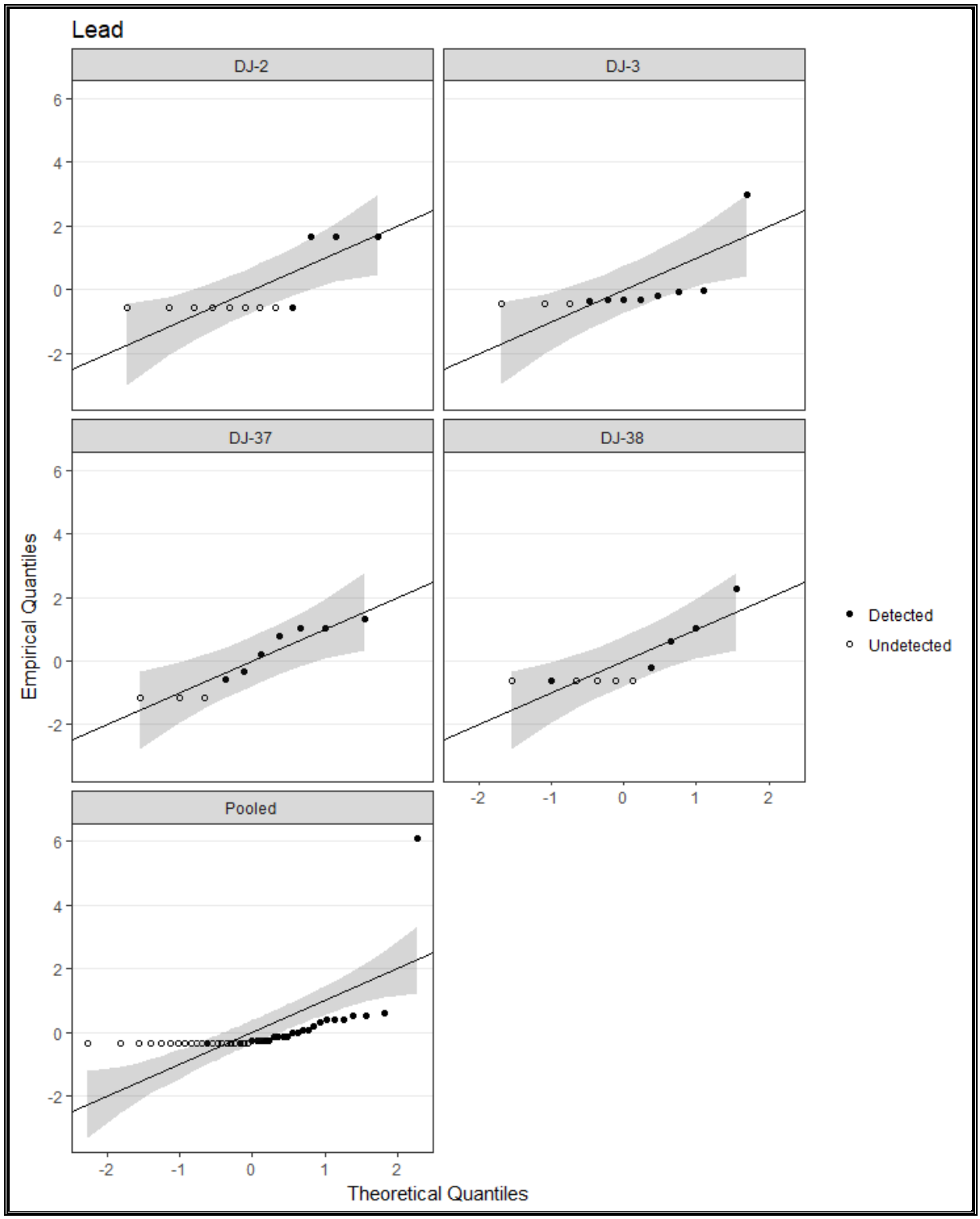

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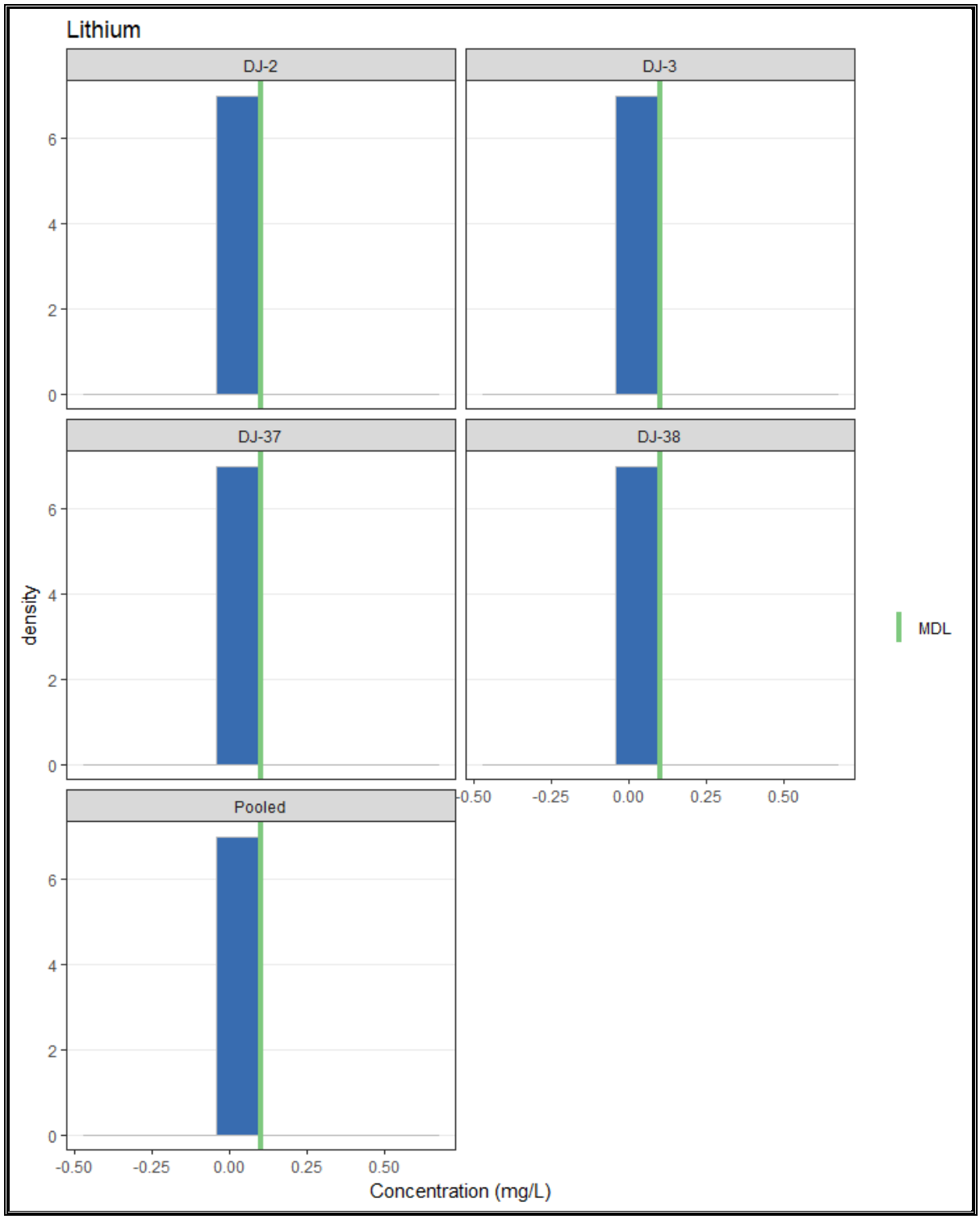

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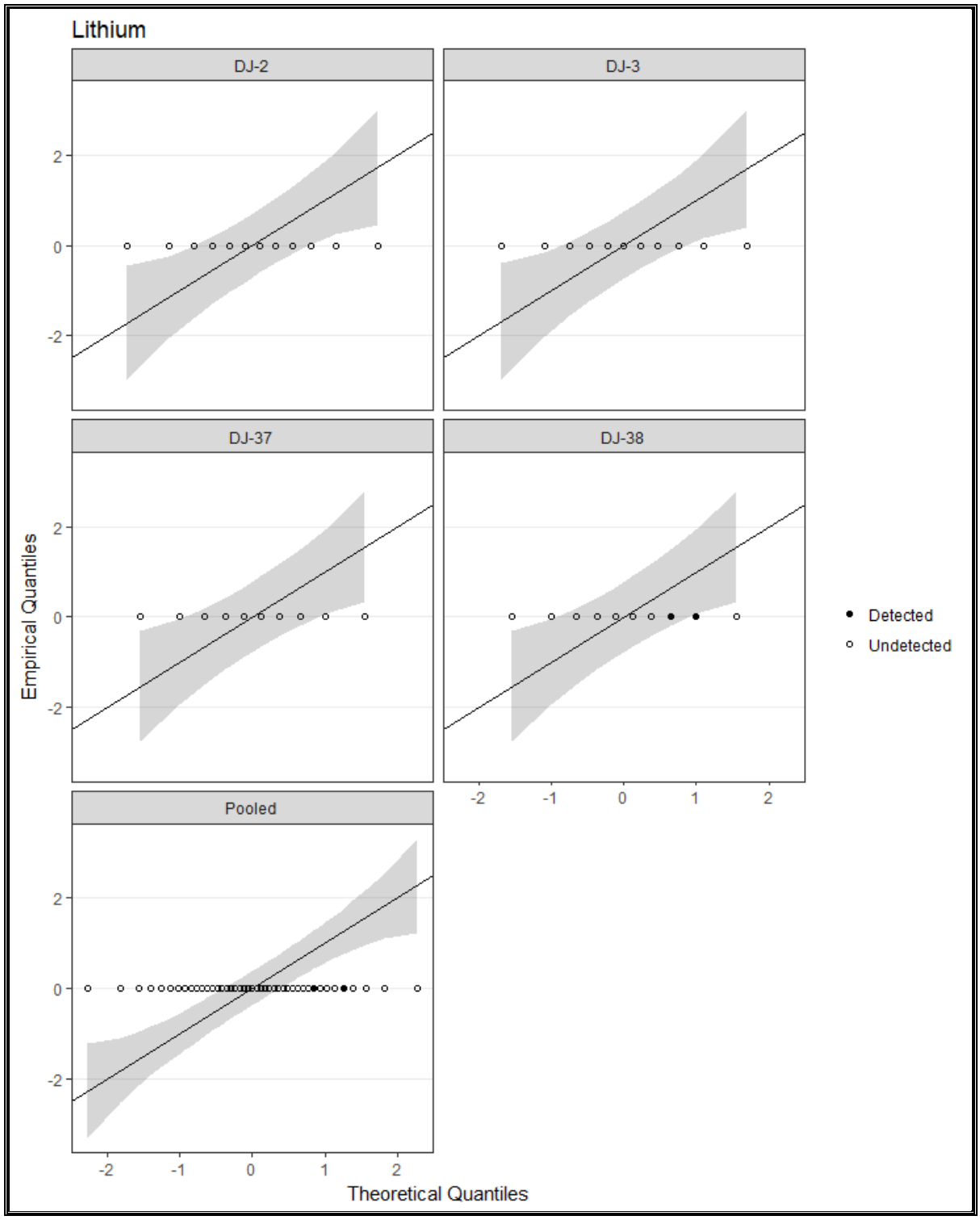

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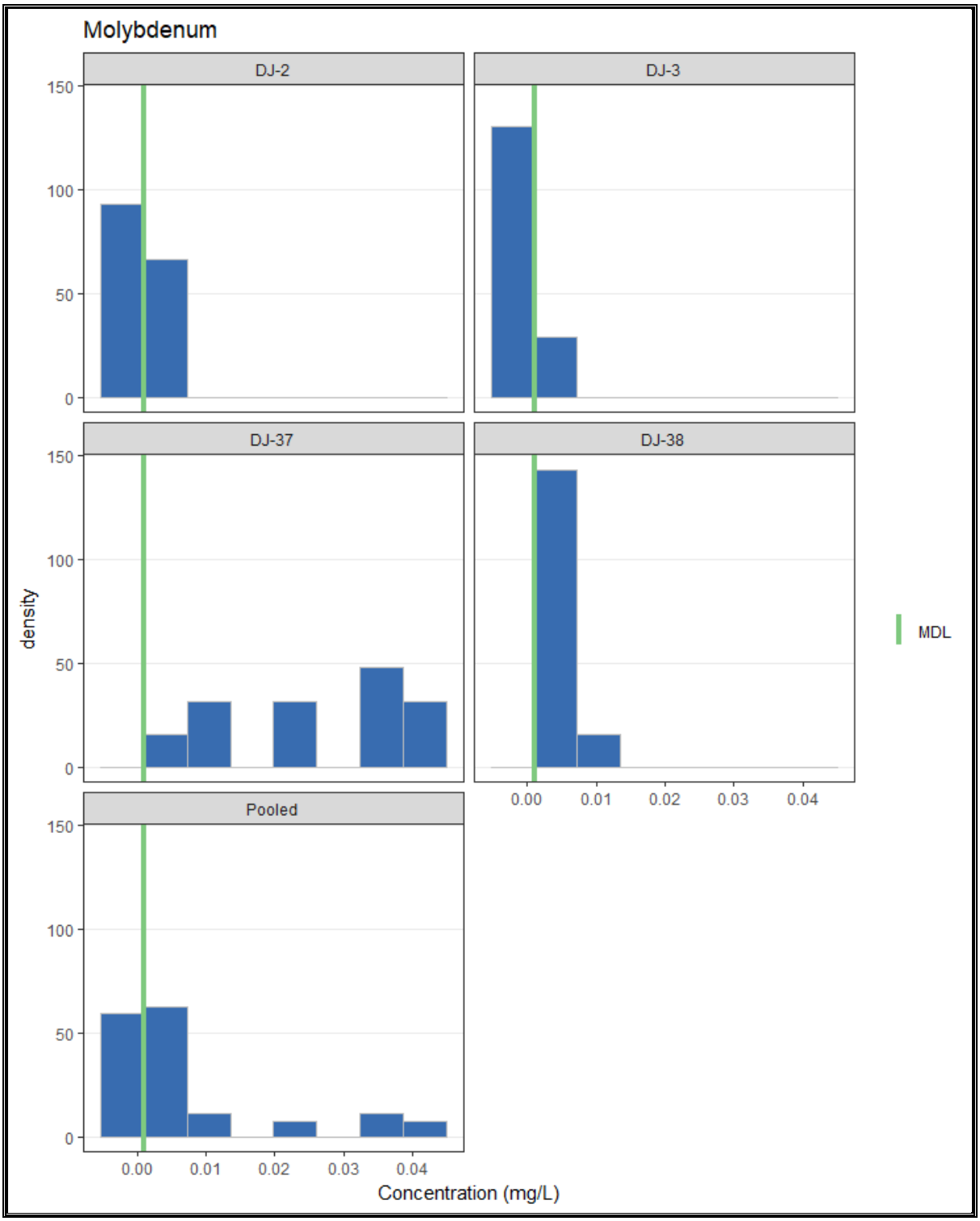

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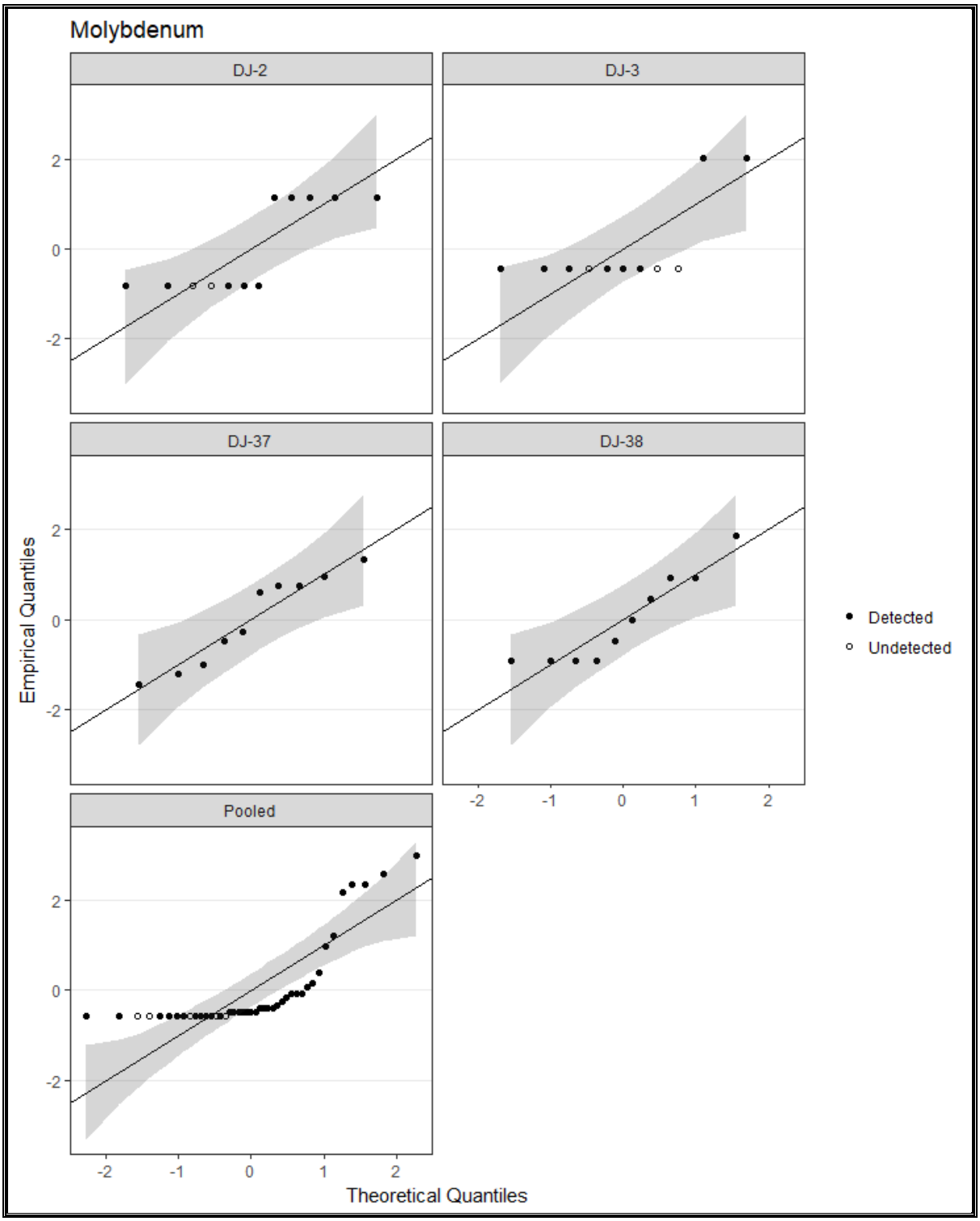

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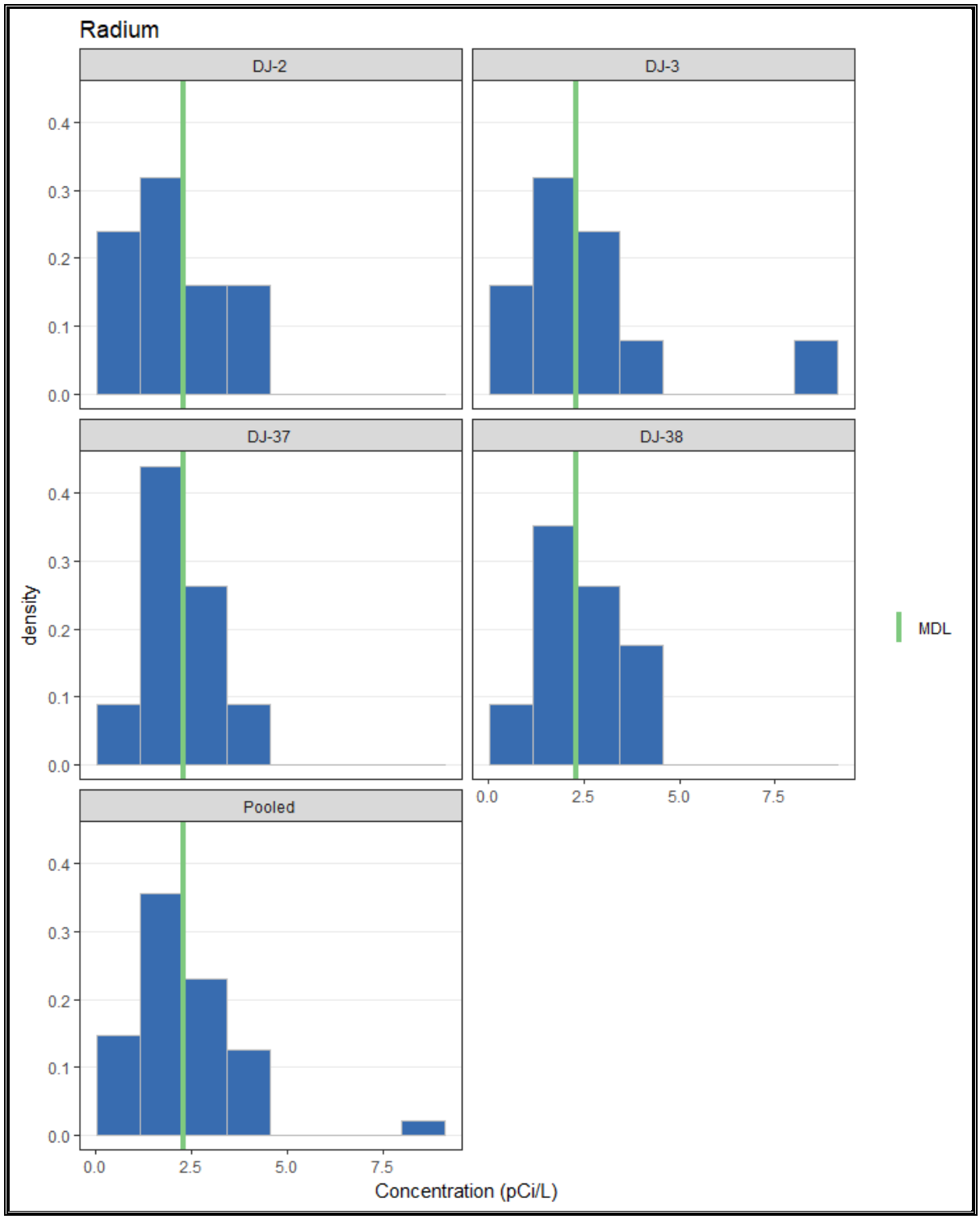

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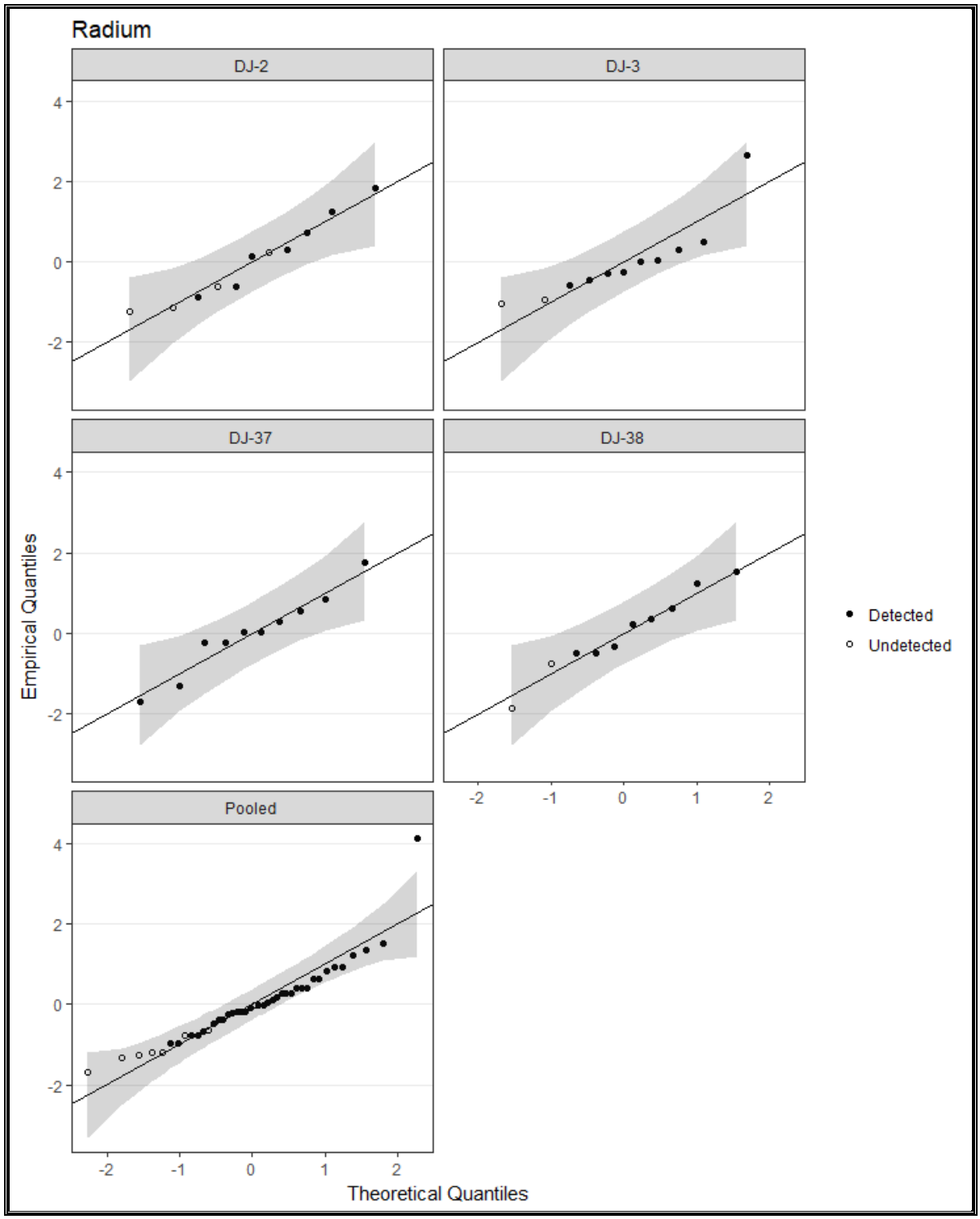

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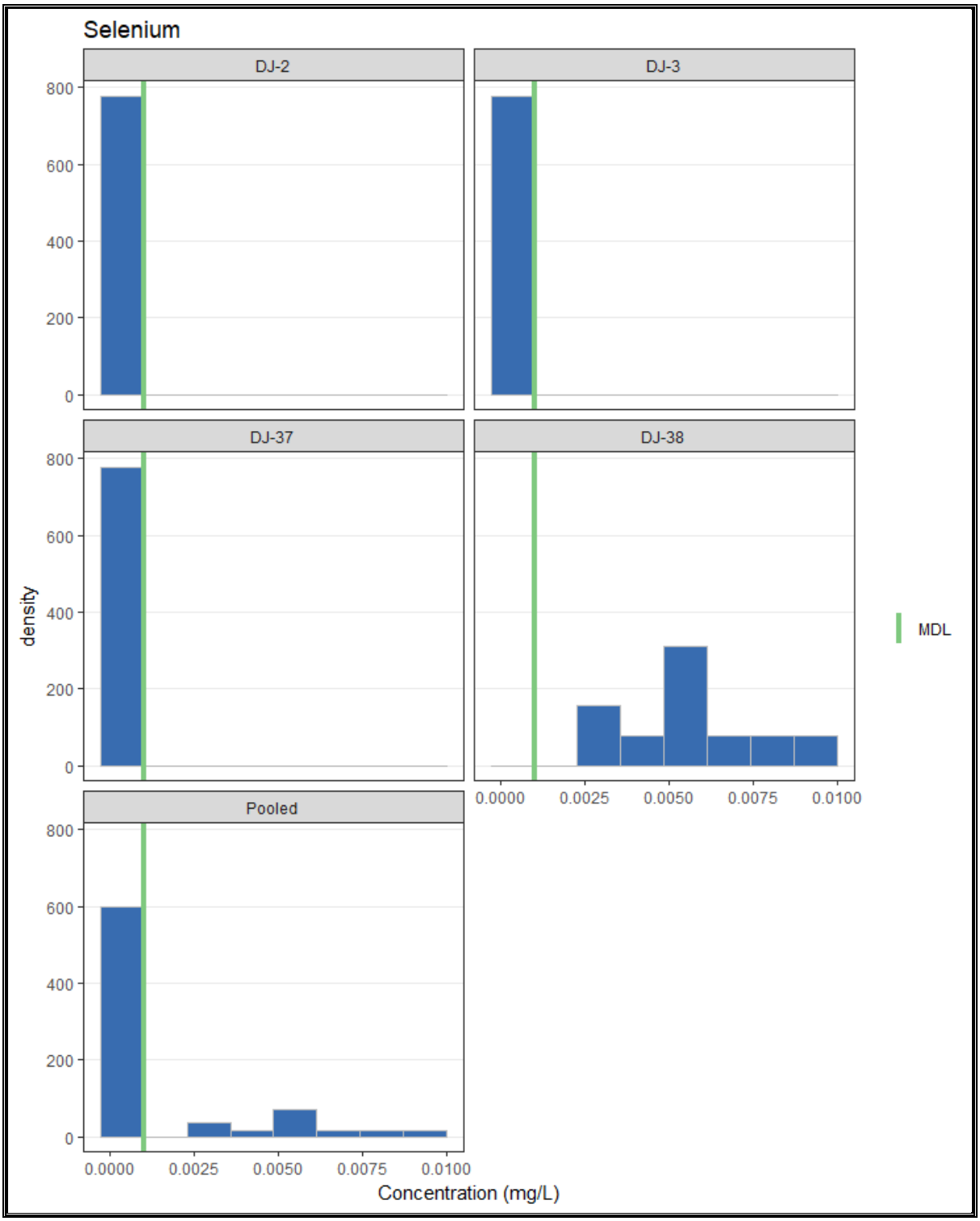

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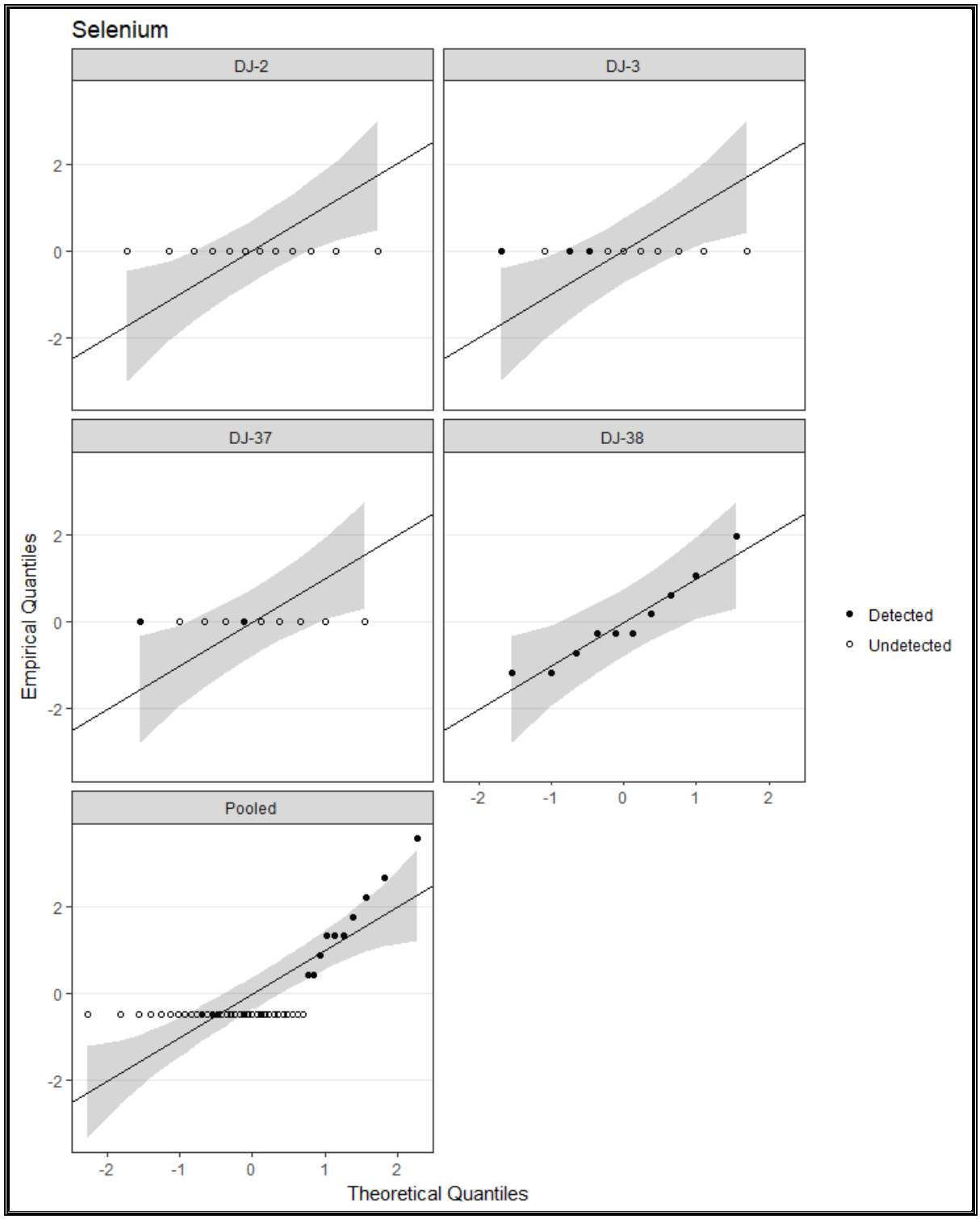

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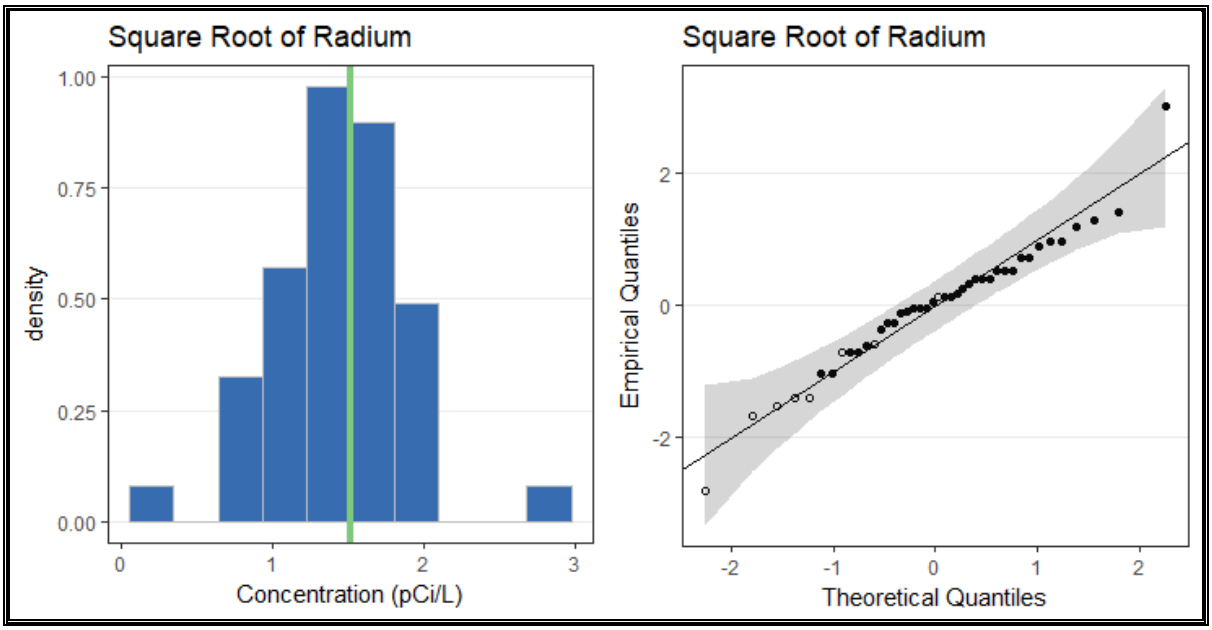

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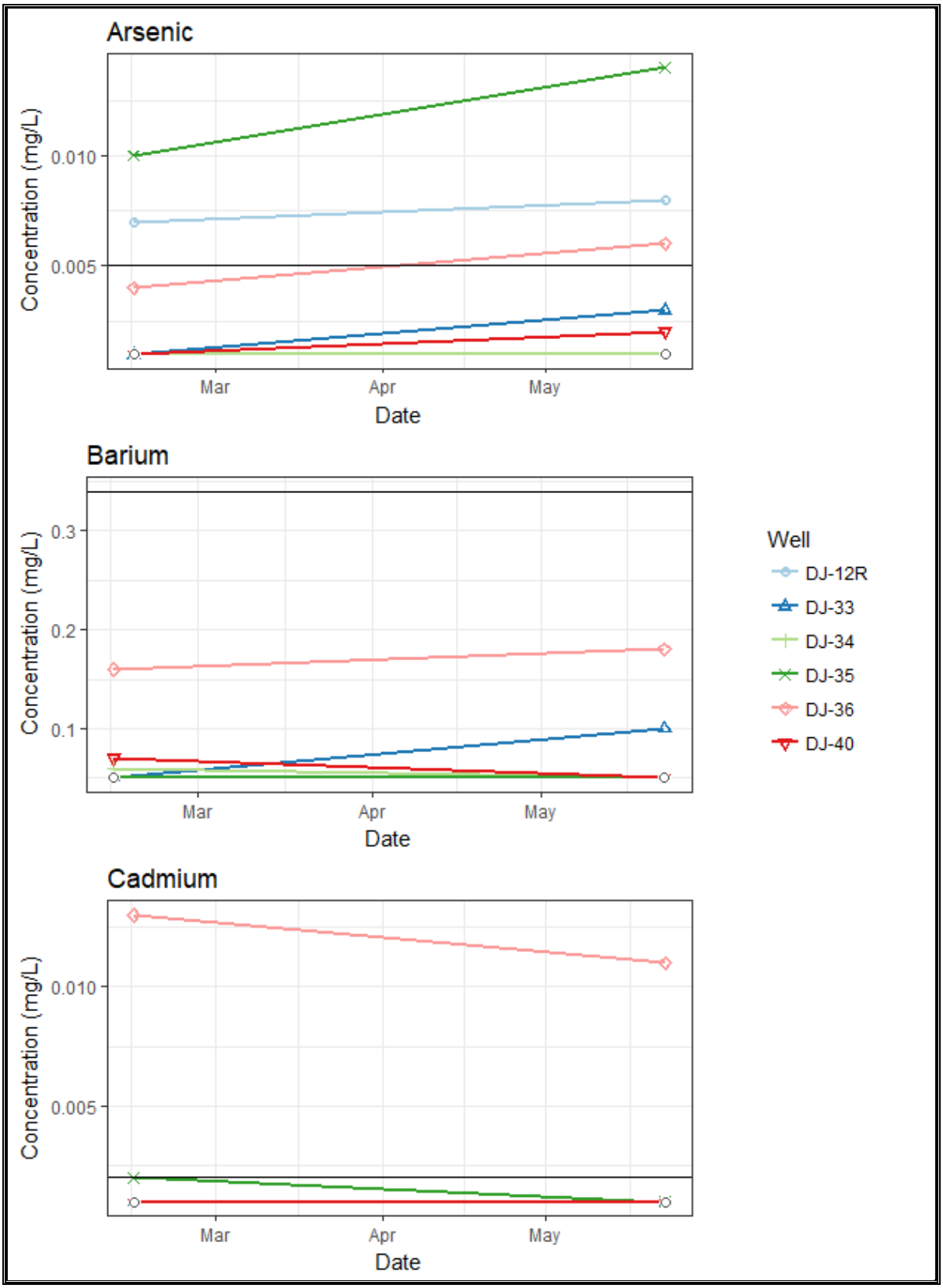

Figure C.4. Upper tolerance limit plots for the Ash Pond.

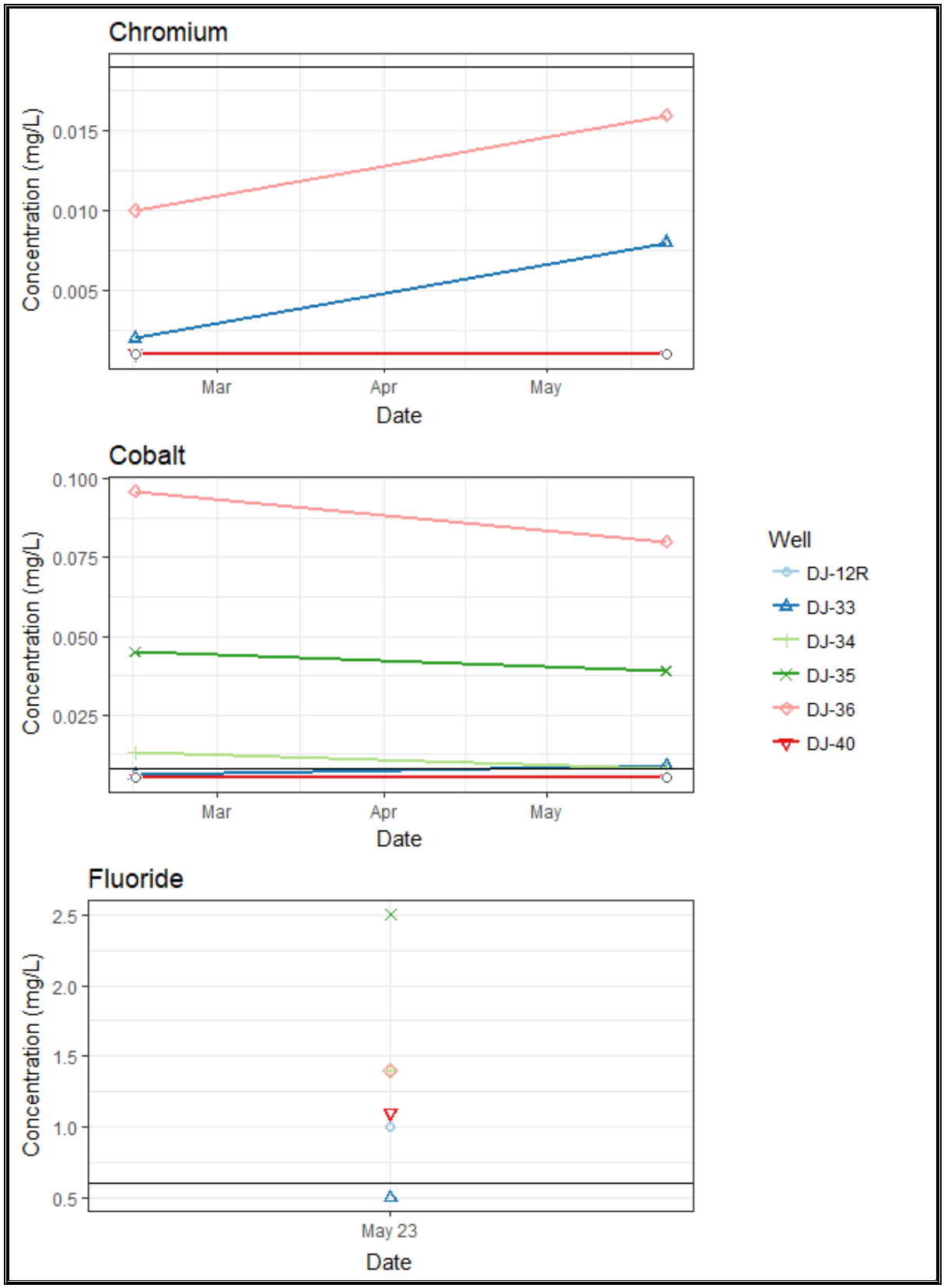

Figure C.4 (cont). Upper tolerance limit plots for the Ash Pond.

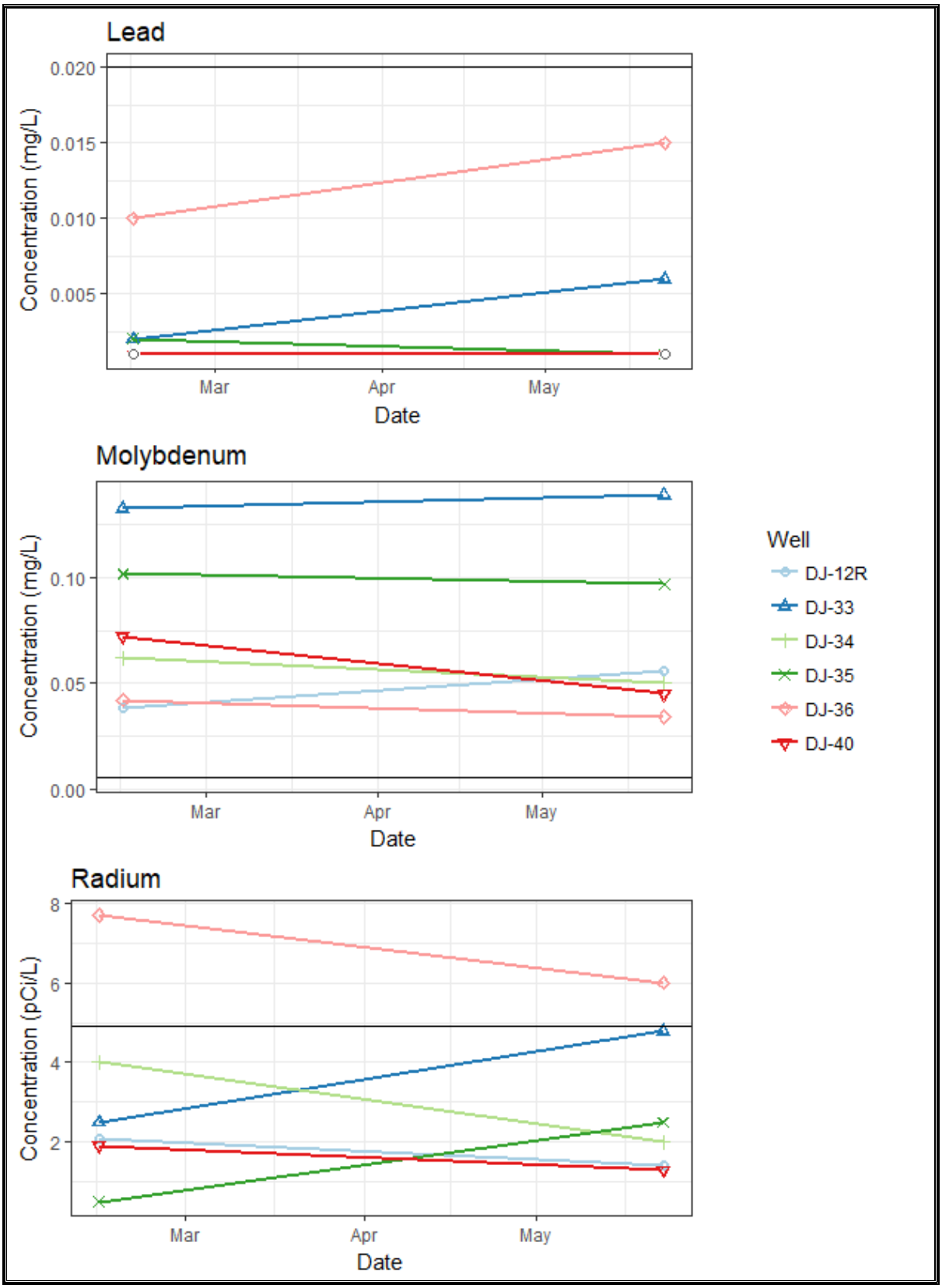

Figure C.4 (cont). Upper tolerance limit plots for the Ash Pond.

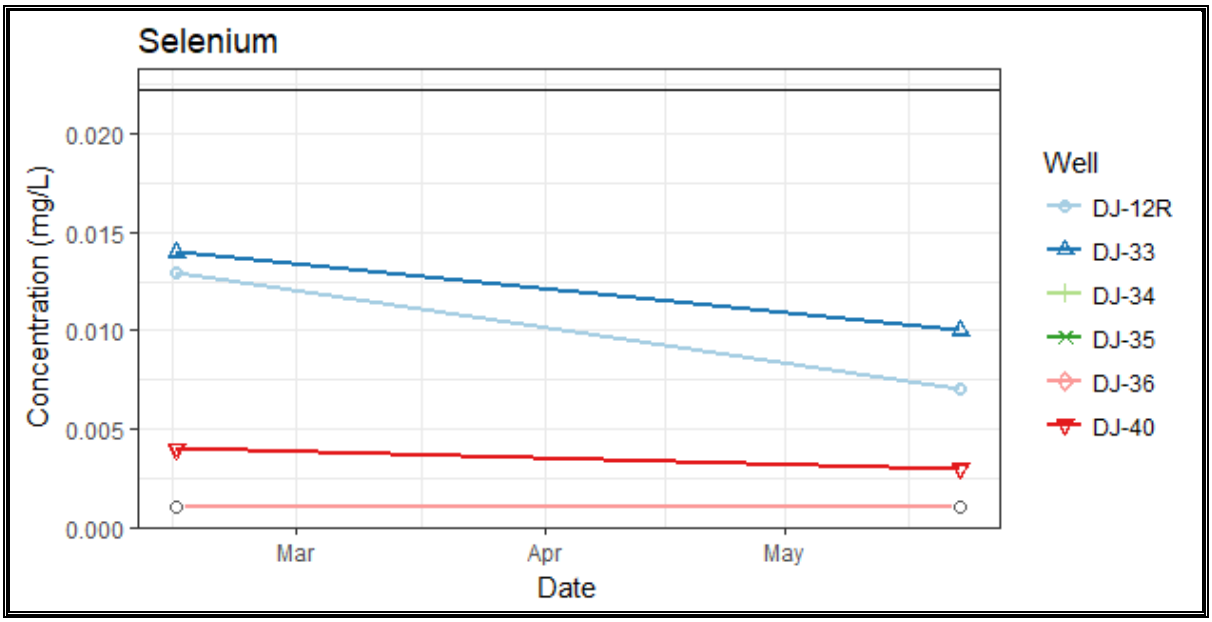

Figure C.4 (cont). Upper tolerance limit plots for the Ash Pond.

Attachment D:

Field Data Sheets

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-38	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	65F, CLEAR		
Depth to Water (ft):	10.82		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	11.20	2,291	2.34	7.29	285.80	143.00
6	11.20	2,284	2.36	7.30	286.20	143.00
8	11.30	2,268	2.66	7.31	286.60	133.00

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:15

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-3	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	65F, CLEAR		
Depth to Water (ft):	20.35		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.80	579	0.42	7.50	42.80	82.10
6	12.80	579	0.32	7.50	36.50	82.10
8	12.80	579	0.25	7.50	36.50	54.90

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

DUP-2 @ 1800

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-33	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	65F, CLEAR		
Depth to Water (ft):	17.92		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	12.10	2,369	0.35	7.47	233.40	647.00
6	12.10	2,358	0.29	7.47	233.10	647.00
8	12.10	2,338	0.24	7.47	232.80	505.00

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	19:15

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	DJ-34	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	65F, CLEAR		
Depth to Water (ft):	17.22		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	13.10	1,208	0.43	7.55	235.70	18.00
6	13.10	1,207	0.40	7.55	235.50	18.00
8	13.20	1,206	0.31	7.55	235.40	2.25

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	19:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	HS-2	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/24/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	65F, CLEAR		
Depth to Water (ft):	75.32		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	13.30	1,520	4.09	7.31	313.90	1,100.00
6	13.30	1,519	4.04	7.31	314.50	1,100.00
8	13.30	1,520	3.98	7.31	315.30	1,100.00

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	09:15

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

LOTS OF SEDIMENT

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	LW	**Project Number:**	PERCM050
Sample ID:	HS-3	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/24/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	65F, CLEAR		
Depth to Water (ft):	61.94		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	13.30	1,330	2.53	7.39	317.70	1,100.00
6	13.30	1,330	2.52	7.39	318.10	1,100.00
8	13.30	1,330	2.48	7.39	318.30	1,100.00

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	09:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

LOTS OD SEDIMENT

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-35	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/24/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	60s, Sunny, breeze		
Depth to Water (ft):	15.23		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	12.70	1,595	0.06	8.49	-50.70	5.55
8	12.70	1,566	0.06	8.50	-63.30	5.55
10	12.70	1,540	0.06	8.53	-80.30	10.20

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	10:10

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-40	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/24/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	60s, sunny, breeze		
Depth to Water (ft):	20.22		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	11.80	958	0.96	9.03	3.40	38.80
8	11.90	957	0.93	9.04	-23.70	38.80
10	12.00	940	1.12	9.06	-35.00	4.95

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	09:40

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-36	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/24/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	60s, sunny, breeze		
Depth to Water (ft):	17.52		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	13.00	1,316	2.28	7.63	167.40	805.00
8	13.00	1,317	2.30	7.63	167.40	805.00
10	13.00	1,318	2.31	7.63	167.10	687.00

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	09:10

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-47	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Cloudy, 60s, breeze		
Depth to Water (ft):	26.8		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	12.30	1,229	0.50	7.19	-77.50	
8	12.30	1,227	0.42	7.19	-79.40	
10	12.30	1,227	0.42	7.19	-80.20	

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:20

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

DUP-1 @ 1725 FB-1 @ 1730

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-43	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	60s, sunny, breeze		
Depth to Water (ft):	24.03		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	19:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Not enough water to collect parameters after collecting sample

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-12R	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, breeze, 50s		
Depth to Water (ft):	16.8		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	11.40	1,361	0.08	11.37	-115.20	19.30
8	11.40	1,343		11.37	-124.80	19.30
10	11.40	1,339	0.07	11.38	-133.00	16.50

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	19:25

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-44	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	60s, sunny, breeze		
Depth to Water (ft):	30.07		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	13.40	1,080	0.62	7.85	111.40	215.00
8	13.40	1,083	0.53	7.86	106.30	215.00
10	13.40	1,082	0.58	7.86	105.70	31.40

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	18:40

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-45	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	60s, sunny, breeze		
Depth to Water (ft):	36.19		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	12.40	1,570	0.20	7.26	121.70	6.84
8	12.40	1,581	0.46	7.22	121.10	6.84
10	12.40	1,574	0.07	7.21	120.10	1.96

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	18:25

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-37	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/24/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, breeze, 60s		
Depth to Water (ft):	17.42		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	12.80	3,055	0.49	6.80	216.40	7.70
8	12.80	3,039	0.27	6.83	208.40	7.70
10	12.90	2,935	0.43	6.84	207.50	6.16

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	08:20

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Dave Johnston Power Plant CCR Monitoring		
Sampler Initials:	Mm	**Project Number:**	PERCM050
Sample ID:	DJ-46	**Project Location:**	Glenrock WY
Water Disposal:	Ground	**Sample Date:**	5/23/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, breeze, 60s		
Depth to Water (ft):	35.27		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
6	12.30	1,021	0.46	7.45	89.70	6.81
8	12.30	1,029	0.48	7.44	88.30	6.81
10	12.30	1,031	0.42	7.44	87.90	8.38

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:55

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Attachment E:

Laboratory Analytical Reports

ANALYTICAL SUMMARY REPORT

June 20, 2018

PacifiCorp
1591 Tank Farm Road
Glenrock, WY 82637

Work Order: C18050869 Quote ID: C5218 - Pacific Corp

Project Name: PERCM50

Energy Laboratories, Inc. Casper WY received the following 21 samples for PacifiCorp on 5/24/2018 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C18050869-001	DJ-38	05/23/18 17:15	05/24/18	Aqueous	Metals by ICP/ICPMS, Total Alkalinity Mercury, Total Fluoride Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite pH Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved
C18050869-002	DJ-3	05/23/18 17:45	05/24/18	Aqueous	Same As Above
C18050869-003	DUP-2	05/23/18 18:00	05/24/18	Aqueous	Same As Above
C18050869-004	DJ-2	05/23/18 18:30	05/24/18	Aqueous	Same As Above
C18050869-005	FB-2	05/23/18 18:30	05/24/18	Aqueous	Same As Above
C18050869-006	DJ-33	05/23/18 19:15	05/24/18	Aqueous	Same As Above
C18050869-007	DJ-34	05/23/18 19:30	05/24/18	Aqueous	Same As Above
C18050869-008	HS-2	05/24/18 09:15	05/24/18	Aqueous	Same As Above
C18050869-009	HS-3	05/24/18 09:45	05/24/18	Aqueous	Same As Above
C18050869-010	DJ-47	05/23/18 17:20	05/24/18	Aqueous	Same As Above
C18050869-011	DJ-46	05/23/18 17:55	05/24/18	Aqueous	Same As Above
C18050869-012	DJ-45	05/23/18 18:25	05/24/18	Aqueous	Same As Above
C18050869-013	DJ-44	05/23/18 18:40	05/24/18	Aqueous	Same As Above
C18050869-014	DJ-12R	05/23/18 19:25	05/24/18	Aqueous	Same As Above
C18050869-015	DJ-43	05/23/18 19:00	05/24/18	Aqueous	Same As Above
C18050869-016	DUP-1	05/23/18 17:25	05/24/18	Aqueous	Same As Above
C18050869-017	FB-1	05/23/18 17:30	05/24/18	Aqueous	Same As Above
C18050869-018	DJ-37	05/24/18 08:20	05/24/18	Aqueous	Same As Above
C18050869-019	DJ-36	05/24/18 09:10	05/24/18	Aqueous	Same As Above
C18050869-020	DJ-40	05/24/18 09:40	05/24/18	Aqueous	Same As Above
C18050869-021	DJ-35	05/24/18 10:10	05/24/18	Aqueous	Same As Above

ANALYTICAL SUMMARY REPORT

The results as reported relate only to the item(s) submitted for testing. The analyses presented in this report were performed at Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these test results, please call.

Report Approved By:

CLIENT: PacifiCorp
Project: PERCM50
Work Order: C18050869

Report Date: 06/20/18

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-001
Client Sample ID: DJ-38

Report Date: 06/20/18
Collection Date: 05/23/18 17:15
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	285	mg/L		5		A2320 B	05/25/18 23:25 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/25/18 23:25 / ljl
Bicarbonate as HCO3	347	mg/L		5		A2320 B	05/25/18 23:25 / ljl
Chloride	58	mg/L		1		E300.0	05/25/18 19:47 / ljl
Fluoride	0.8	mg/L		0.1		A4500-F C	05/29/18 15:27 / ljl
Sulfate	765	mg/L	D	2		E300.0	05/25/18 19:47 / ljl
Calcium	176	mg/L		1		E200.7	06/07/18 12:51 / eli-b
Magnesium	98	mg/L		1		E200.7	06/07/18 12:51 / eli-b
Potassium	4	mg/L		1		E200.7	06/07/18 12:51 / eli-b
Sodium	175	mg/L	D	4		E200.7	06/07/18 12:51 / eli-b
PHYSICAL PROPERTIES							
pH	7.55	s.u.	H	0.01		A4500-H B	05/25/18 07:53 / mvr
pH Measurement Temp	12	°C				A4500-H B	05/25/18 07:53 / mvr
Solids, Total Dissolved TDS @ 180 C	1580	mg/L	D	20		A2540 C	05/25/18 15:38 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	7.50	mg/L	D	0.05		E353.2	05/25/18 15:39 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Barium	0.06	mg/L		0.05		E200.7	06/07/18 12:51 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Boron	0.24	mg/L	D	0.09		E200.7	06/07/18 12:51 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Chromium	0.002	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 19:51 / eli-b
Lead	0.002	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 12:51 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:20 / eli-b
Molybdenum	0.005	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	06/07/18 19:51 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/07/18 19:51 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 228	1.3	pCi/L	U			RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	1.8	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-001
Client Sample ID: DJ-38

Report Date: 06/20/18
Collection Date: 05/23/18 17:15
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-002
Client Sample ID: DJ-3

Report Date: 06/20/18
Collection Date: 05/23/18 17:45
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	226	mg/L		5		A2320 B	05/25/18 23:33 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/25/18 23:33 / ljl
Bicarbonate as HCO3	275	mg/L		5		A2320 B	05/25/18 23:33 / ljl
Chloride	14	mg/L		1		E300.0	05/25/18 20:06 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	05/29/18 15:30 / ljl
Sulfate	37	mg/L		1		E300.0	05/25/18 20:06 / ljl
Calcium	58	mg/L		1		E200.7	06/07/18 12:54 / eli-b
Magnesium	22	mg/L		1		E200.7	06/07/18 12:54 / eli-b
Potassium	5	mg/L		1		E200.7	06/07/18 12:54 / eli-b
Sodium	25	mg/L		1		E200.7	06/07/18 12:54 / eli-b
PHYSICAL PROPERTIES							
pH	7.69	s.u.	H	0.01		A4500-H B	05/25/18 07:59 / mvr
pH Measurement Temp	12	°C				A4500-H B	05/25/18 07:59 / mvr
Solids, Total Dissolved TDS @ 180 C	305	mg/L		10		A2540 C	05/25/18 15:38 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.05	mg/L		0.01		E353.2	05/25/18 15:40 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Barium	0.11	mg/L		0.05		E200.7	06/07/18 12:54 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Boron	0.08	mg/L		0.05		E200.7	06/07/18 12:54 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 19:56 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 12:54 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:26 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	06/07/18 19:56 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 11:43 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/07/18 19:56 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.8	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 MDC	0.3	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 228	0.6	pCi/L	U			RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1.3	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	2.1	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	1.4	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-002
Client Sample ID: DJ-3

Report Date: 06/20/18
Collection Date: 05/23/18 17:45
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.1	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-003
Client Sample ID: DUP-2

Report Date: 06/20/18
Collection Date: 05/23/18 18:00
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	225	mg/L		5		A2320 B	05/25/18 23:42 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/25/18 23:42 / ljl
Bicarbonate as HCO3	274	mg/L		5		A2320 B	05/25/18 23:42 / ljl
Chloride	14	mg/L		1		E300.0	05/25/18 21:03 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	05/29/18 15:33 / ljl
Sulfate	37	mg/L		1		E300.0	05/25/18 21:03 / ljl
Calcium	59	mg/L		1		E200.7	06/07/18 12:58 / eli-b
Magnesium	22	mg/L		1		E200.7	06/07/18 12:58 / eli-b
Potassium	5	mg/L		1		E200.7	06/07/18 12:58 / eli-b
Sodium	26	mg/L		1		E200.7	06/07/18 12:58 / eli-b
PHYSICAL PROPERTIES							
pH	7.66	s.u.	H	0.01		A4500-H B	05/25/18 08:01 / mvr
pH Measurement Temp	12	°C				A4500-H B	05/25/18 08:01 / mvr
Solids, Total Dissolved TDS @ 180 C	295	mg/L		10		A2540 C	05/25/18 15:38 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.05	mg/L		0.01		E353.2	05/25/18 15:41 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Barium	0.11	mg/L		0.05		E200.7	06/07/18 12:58 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Boron	0.08	mg/L		0.05		E200.7	06/07/18 12:58 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 20:00 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 12:58 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:28 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	06/07/18 20:00 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 11:47 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/07/18 20:00 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.6	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 MDC	0.3	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 228	3.9	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1.3	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	2.0	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	4.5	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-003
Client Sample ID: DUP-2

Report Date: 06/20/18
Collection Date: 05/23/18 18:00
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.1	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-004
Client Sample ID: DJ-2

Report Date: 06/20/18
Collection Date: 05/23/18 18:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	230	mg/L		5		A2320 B	05/25/18 23:50 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/25/18 23:50 / ljl
Bicarbonate as HCO3	277	mg/L		5		A2320 B	05/25/18 23:50 / ljl
Chloride	23	mg/L		1		E300.0	05/25/18 21:23 / ljl
Fluoride	0.2	mg/L		0.1		A4500-F C	05/29/18 15:35 / ljl
Sulfate	163	mg/L		1		E300.0	05/25/18 21:23 / ljl
Calcium	41	mg/L		1		E200.7	06/07/18 13:02 / eli-b
Magnesium	17	mg/L		1		E200.7	06/07/18 13:02 / eli-b
Potassium	4	mg/L		1		E200.7	06/07/18 13:02 / eli-b
Sodium	132	mg/L		1		E200.7	06/07/18 13:02 / eli-b
PHYSICAL PROPERTIES							
pH	8.02	s.u.	H	0.01		A4500-H B	05/25/18 08:04 / mvr
pH Measurement Temp	13	°C				A4500-H B	05/25/18 08:04 / mvr
Solids, Total Dissolved TDS @ 180 C	521	mg/L		10		A2540 C	05/25/18 15:38 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.04	mg/L		0.01		E353.2	05/25/18 15:43 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Barium	0.09	mg/L		0.05		E200.7	06/07/18 13:02 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Boron	0.13	mg/L		0.05		E200.7	06/07/18 13:02 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Chromium	0.002	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 20:16 / eli-b
Lead	0.001	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 13:02 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:29 / eli-b
Molybdenum	0.001	mg/L		0.001		E200.8	06/07/18 20:16 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 11:52 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 11:52 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.7	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 MDC	0.3	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 228	0.3	pCi/L	U			RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	2.3	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	1	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-004
Client Sample ID: DJ-2

Report Date: 06/20/18
Collection Date: 05/23/18 18:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-005
Client Sample ID: FB-2

Report Date: 06/20/18
Collection Date: 05/23/18 18:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	ND	mg/L		5		A2320 B	05/25/18 23:54 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/25/18 23:54 / ljl
Bicarbonate as HCO3	ND	mg/L		5		A2320 B	05/25/18 23:54 / ljl
Chloride	ND	mg/L		1		E300.0	05/25/18 21:42 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	05/29/18 15:41 / ljl
Sulfate	ND	mg/L		1		E300.0	05/25/18 21:42 / ljl
Calcium	ND	mg/L		1		E200.7	06/07/18 13:06 / eli-b
Magnesium	ND	mg/L		1		E200.7	06/07/18 13:06 / eli-b
Potassium	ND	mg/L		1		E200.7	06/07/18 13:06 / eli-b
Sodium	ND	mg/L		1		E200.7	06/07/18 13:06 / eli-b
PHYSICAL PROPERTIES							
pH	6.05	s.u.	H	0.01		A4500-H B	05/25/18 08:07 / mvr
pH Measurement Temp	13	°C				A4500-H B	05/25/18 08:07 / mvr
Solids, Total Dissolved TDS @ 180 C	ND	mg/L		10		A2540 C	05/25/18 15:38 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.01		E353.2	05/25/18 15:44 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Barium	ND	mg/L		0.05		E200.7	06/07/18 13:06 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Boron	ND	mg/L		0.05		E200.7	06/07/18 13:06 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 20:21 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 13:06 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:31 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	06/07/18 20:21 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 11:56 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 11:56 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.2	pCi/L	U			E903.0	06/12/18 10:13 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 226 MDC	0.4	pCi/L				E903.0	06/12/18 10:13 / arh
Radium 228	3.2	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.6	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	3.6	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	3.5	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.6	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-005
Client Sample ID: FB-2

Report Date: 06/20/18
Collection Date: 05/23/18 18:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	3.6	pCi/L				A7500-RA	06/14/18 14:44 / dmf

- MDC for Ra228 is high due to low, but acceptable, chemical recovery. No volume remains for a reanalysis.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-006
Client Sample ID: DJ-33

Report Date: 06/20/18
Collection Date: 05/23/18 19:15
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	210	mg/L		5		A2320 B	05/26/18 00:02 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:02 / ljl
Bicarbonate as HCO3	256	mg/L		5		A2320 B	05/26/18 00:02 / ljl
Chloride	48	mg/L		1		E300.0	05/25/18 22:01 / ljl
Fluoride	0.5	mg/L		0.1		A4500-F C	05/29/18 15:44 / ljl
Sulfate	882	mg/L	D	2		E300.0	05/25/18 22:01 / ljl
Calcium	207	mg/L		1		E200.7	06/07/18 13:18 / eli-b
Magnesium	73	mg/L		1		E200.7	06/07/18 13:18 / eli-b
Potassium	16	mg/L		1		E200.7	06/07/18 13:18 / eli-b
Sodium	214	mg/L	D	4		E200.7	06/07/18 13:18 / eli-b
PHYSICAL PROPERTIES							
pH	7.68	s.u.	H	0.01		A4500-H B	05/25/18 08:10 / mvr
pH Measurement Temp	14	°C				A4500-H B	05/25/18 08:10 / mvr
Solids, Total Dissolved TDS @ 180 C	1620	mg/L	D	20		A2540 C	05/25/18 15:39 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	1.44	mg/L		0.01		E353.2	05/25/18 15:45 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Arsenic	0.003	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Barium	0.10	mg/L		0.05		E200.7	06/07/18 13:18 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Boron	1.54	mg/L	D	0.09		E200.7	06/07/18 13:18 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Chromium	0.008	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Cobalt	0.009	mg/L		0.005		E200.8	06/07/18 20:25 / eli-b
Lead	0.006	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/08/18 19:32 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:33 / eli-b
Molybdenum	0.139	mg/L		0.001		E200.8	06/07/18 20:25 / eli-b
Selenium	0.010	mg/L		0.001		E200.8	06/09/18 12:01 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:01 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.7	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 228	4.1	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	4.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-006
Client Sample ID: DJ-33

Report Date: 06/20/18
Collection Date: 05/23/18 19:15
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-007
Client Sample ID: DJ-34

Report Date: 06/20/18
Collection Date: 05/23/18 19:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	123	mg/L		5		A2320 B	05/26/18 00:10 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:10 / ljl
Bicarbonate as HCO3	150	mg/L		5		A2320 B	05/26/18 00:10 / ljl
Chloride	28	mg/L		1		E300.0	05/25/18 22:20 / ljl
Fluoride	1.4	mg/L		0.1		A4500-F C	05/29/18 15:46 / ljl
Sulfate	407	mg/L	D	2		E300.0	05/25/18 22:20 / ljl
Calcium	118	mg/L		1		E200.7	06/07/18 13:21 / eli-b
Magnesium	32	mg/L		1		E200.7	06/07/18 13:21 / eli-b
Potassium	4	mg/L		1		E200.7	06/07/18 13:21 / eli-b
Sodium	84	mg/L	D	2		E200.7	06/07/18 13:21 / eli-b
PHYSICAL PROPERTIES							
pH	7.69	s.u.	H	0.01		A4500-H B	05/25/18 08:13 / mvr
pH Measurement Temp	14	°C				A4500-H B	05/25/18 08:13 / mvr
Solids, Total Dissolved TDS @ 180 C	786	mg/L		10		A2540 C	05/25/18 15:39 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.02	mg/L		0.01		E353.2	05/25/18 15:46 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Barium	ND	mg/L		0.05		E200.7	06/07/18 13:21 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Boron	1.58	mg/L		0.05		E200.7	06/07/18 13:21 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Cobalt	0.008	mg/L		0.005		E200.8	06/07/18 20:29 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/08/18 19:36 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:39 / eli-b
Molybdenum	0.050	mg/L		0.001		E200.8	06/07/18 20:29 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 12:06 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:06 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 228	1.8	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	2.0	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-007
Client Sample ID: DJ-34

Report Date: 06/20/18
Collection Date: 05/23/18 19:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-008
Client Sample ID: HS-2

Report Date: 06/20/18
Collection Date: 05/24/18 09:15
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	207	mg/L		5		A2320 B	05/26/18 00:18 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:18 / ljl
Bicarbonate as HCO3	252	mg/L		5		A2320 B	05/26/18 00:18 / ljl
Chloride	20	mg/L		1		E300.0	05/25/18 22:40 / ljl
Fluoride	0.6	mg/L		0.1		A4500-F C	05/29/18 15:49 / ljl
Sulfate	491	mg/L	D	2		E300.0	05/25/18 22:40 / ljl
Calcium	196	mg/L		1		E200.7	06/07/18 13:25 / eli-b
Magnesium	49	mg/L		1		E200.7	06/07/18 13:25 / eli-b
Potassium	12	mg/L		1		E200.7	06/07/18 13:25 / eli-b
Sodium	99	mg/L	D	2		E200.7	06/07/18 13:25 / eli-b
PHYSICAL PROPERTIES							
pH	7.54	s.u.	H	0.01		A4500-H B	05/25/18 08:16 / mvr
pH Measurement Temp	14	°C				A4500-H B	05/25/18 08:16 / mvr
Solids, Total Dissolved TDS @ 180 C	1060	mg/L		10		A2540 C	05/25/18 15:40 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	9.3	mg/L	D	0.1		E353.2	05/25/18 15:47 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Arsenic	0.019	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Barium	0.64	mg/L		0.05		E200.7	06/07/18 13:25 / eli-b
Beryllium	0.001	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Boron	0.08	mg/L		0.05		E200.7	06/07/18 13:25 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Chromium	0.058	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Cobalt	0.017	mg/L		0.005		E200.8	06/07/18 20:33 / eli-b
Lead	0.027	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/08/18 19:40 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:41 / eli-b
Molybdenum	0.004	mg/L		0.001		E200.8	06/07/18 20:33 / eli-b
Selenium	0.029	mg/L		0.001		E200.8	06/09/18 12:10 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:10 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	1.0	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 precision (±)	0.3	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 228	3.3	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 precision (±)	1.5	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 228 MDC	1.9	pCi/L				RA-05	06/07/18 09:16 / plj
Radium 226 + Radium 228	4.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.6	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-008
Client Sample ID: HS-2

Report Date: 06/20/18
Collection Date: 05/24/18 09:15
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.9	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-009
Client Sample ID: HS-3

Report Date: 06/20/18
Collection Date: 05/24/18 09:45
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	206	mg/L		5		A2320 B	05/26/18 00:26 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:26 / ljl
Bicarbonate as HCO3	251	mg/L		5		A2320 B	05/26/18 00:26 / ljl
Chloride	19	mg/L		1		E300.0	05/25/18 22:59 / ljl
Fluoride	0.6	mg/L		0.1		A4500-F C	05/30/18 10:57 / ljl
Sulfate	394	mg/L	D	2		E300.0	05/25/18 22:59 / ljl
Calcium	150	mg/L		1		E200.7	06/07/18 13:29 / eli-b
Magnesium	39	mg/L		1		E200.7	06/07/18 13:29 / eli-b
Potassium	9	mg/L		1		E200.7	06/07/18 13:29 / eli-b
Sodium	89	mg/L	D	2		E200.7	06/07/18 13:29 / eli-b
PHYSICAL PROPERTIES							
pH	7.55	s.u.	H	0.01		A4500-H B	05/25/18 08:19 / mvr
pH Measurement Temp	14	°C				A4500-H B	05/25/18 08:19 / mvr
Solids, Total Dissolved TDS @ 180 C	889	mg/L		10		A2540 C	05/25/18 15:40 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	6.75	mg/L	D	0.05		E353.2	05/25/18 15:49 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Arsenic	0.009	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Barium	0.23	mg/L		0.05		E200.7	06/07/18 13:29 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Boron	0.08	mg/L		0.05		E200.7	06/07/18 13:29 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Chromium	0.018	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Cobalt	0.008	mg/L		0.005		E200.8	06/07/18 20:38 / eli-b
Lead	0.012	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/08/18 19:44 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:43 / eli-b
Molybdenum	0.002	mg/L		0.001		E200.8	06/07/18 20:38 / eli-b
Selenium	0.020	mg/L		0.001		E200.8	06/09/18 12:15 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:15 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	1.1	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 precision (±)	0.3	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 10:14 / arh
Radium 228	2.0	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.2	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	3.1	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.2	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-009
Client Sample ID: HS-3

Report Date: 06/20/18
Collection Date: 05/24/18 09:45
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-010
Client Sample ID: DJ-47

Report Date: 06/20/18
Collection Date: 05/23/18 17:20
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	210	mg/L		5		A2320 B	05/26/18 00:43 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:43 / ljl
Bicarbonate as HCO3	256	mg/L		5		A2320 B	05/26/18 00:43 / ljl
Chloride	43	mg/L		1		E300.0	05/25/18 23:18 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	05/30/18 11:03 / ljl
Sulfate	400	mg/L	D	2		E300.0	05/25/18 23:18 / ljl
Calcium	126	mg/L		1		E200.7	06/07/18 13:33 / eli-b
Magnesium	45	mg/L		1		E200.7	06/07/18 13:33 / eli-b
Potassium	6	mg/L		1		E200.7	06/07/18 13:33 / eli-b
Sodium	79	mg/L	D	4		E200.7	06/08/18 19:47 / eli-b
PHYSICAL PROPERTIES							
pH	7.55	s.u.	H	0.01		A4500-H B	05/25/18 08:22 / mvr
pH Measurement Temp	14	°C				A4500-H B	05/25/18 08:22 / mvr
Solids, Total Dissolved TDS @ 180 C	903	mg/L		10		A2540 C	05/25/18 15:40 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.01		E353.2	05/25/18 15:52 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Barium	0.06	mg/L		0.05		E200.7	06/07/18 13:33 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Boron	0.10	mg/L		0.05		E200.7	06/07/18 13:33 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 20:46 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/08/18 19:47 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:45 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	06/07/18 20:46 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 12:56 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:56 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.7	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 228	2.0	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.3	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	2.7	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-010
Client Sample ID: DJ-47

Report Date: 06/20/18
Collection Date: 05/23/18 17:20
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-011
Client Sample ID: DJ-46

Report Date: 06/20/18
Collection Date: 05/23/18 17:55
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	134	mg/L		5		A2320 B	05/26/18 00:50 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:50 / ljl
Bicarbonate as HCO3	164	mg/L		5		A2320 B	05/26/18 00:50 / ljl
Chloride	11	mg/L		1		E300.0	05/26/18 00:16 / ljl
Fluoride	0.5	mg/L		0.1		A4500-F C	05/30/18 11:09 / ljl
Sulfate	399	mg/L	D	2		E300.0	05/26/18 00:16 / ljl
Calcium	126	mg/L		1		E200.7	06/07/18 13:52 / eli-b
Magnesium	44	mg/L		1		E200.7	06/07/18 13:52 / eli-b
Potassium	5	mg/L		1		E200.7	06/07/18 13:52 / eli-b
Sodium	45	mg/L	D	2		E200.7	06/07/18 13:52 / eli-b
PHYSICAL PROPERTIES							
pH	7.79	s.u.	H	0.01		A4500-H B	05/25/18 08:25 / mvr
pH Measurement Temp	14	°C				A4500-H B	05/25/18 08:25 / mvr
Solids, Total Dissolved TDS @ 180 C	787	mg/L		10		A2540 C	05/25/18 15:41 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	3.88	mg/L	D	0.05		E353.2	05/25/18 15:56 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Barium	0.06	mg/L		0.05		E200.7	06/07/18 13:52 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Boron	0.25	mg/L		0.05		E200.7	06/07/18 13:52 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 20:42 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 23:32 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:47 / eli-b
Molybdenum	0.003	mg/L		0.001		E200.8	06/07/18 20:42 / eli-b
Selenium	0.018	mg/L		0.001		E200.8	06/09/18 12:29 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:29 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 228	4.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.6	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	4.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.6	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-011
Client Sample ID: DJ-46

Report Date: 06/20/18
Collection Date: 05/23/18 17:55
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-012
Client Sample ID: DJ-45

Report Date: 06/20/18
Collection Date: 05/23/18 18:25
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	185	mg/L		5		A2320 B	05/26/18 00:58 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 00:58 / ljl
Bicarbonate as HCO3	226	mg/L		5		A2320 B	05/26/18 00:58 / ljl
Chloride	34	mg/L		1		E300.0	05/26/18 00:35 / ljl
Fluoride	1.1	mg/L		0.1		A4500-F C	05/30/18 11:11 / ljl
Sulfate	606	mg/L	D	2		E300.0	05/26/18 00:35 / ljl
Calcium	186	mg/L		1		E200.7	06/07/18 14:04 / eli-b
Magnesium	52	mg/L		1		E200.7	06/07/18 14:04 / eli-b
Potassium	8	mg/L		1		E200.7	06/12/18 23:36 / eli-b
Sodium	114	mg/L	D	8		E200.7	06/12/18 23:36 / eli-b
PHYSICAL PROPERTIES							
pH	7.59	s.u.	H	0.01		A4500-H B	05/25/18 08:31 / mvr
pH Measurement Temp	15	°C				A4500-H B	05/25/18 08:31 / mvr
Solids, Total Dissolved TDS @ 180 C	1240	mg/L		10		A2540 C	05/25/18 15:41 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	11.3	mg/L	D	0.1		E353.2	05/25/18 15:57 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/07/18 21:11 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Boron	1.93	mg/L		0.05		E200.7	06/07/18 14:04 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Cobalt	0.023	mg/L		0.005		E200.8	06/07/18 21:11 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 23:36 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:48 / eli-b
Molybdenum	0.005	mg/L		0.001		E200.8	06/07/18 21:11 / eli-b
Selenium	0.031	mg/L		0.001		E200.8	06/09/18 12:33 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:33 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.3	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 228	1.1	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.3	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	1.4	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.5	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-012
Client Sample ID: DJ-45

Report Date: 06/20/18
Collection Date: 05/23/18 18:25
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-013
Client Sample ID: DJ-44

Report Date: 06/20/18
Collection Date: 05/23/18 18:40
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	71	mg/L		5		A2320 B	05/26/18 01:06 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 01:06 / ljl
Bicarbonate as HCO3	87	mg/L		5		A2320 B	05/26/18 01:06 / ljl
Chloride	22	mg/L		1		E300.0	05/26/18 01:32 / ljl
Fluoride	2.2	mg/L		0.1		A4500-F C	05/30/18 11:14 / ljl
Sulfate	417	mg/L	D	2		E300.0	05/26/18 01:32 / ljl
Calcium	77	mg/L		1		E200.7	06/07/18 14:07 / eli-b
Magnesium	9	mg/L		1		E200.7	06/07/18 14:07 / eli-b
Potassium	6	mg/L		1		E200.7	06/12/18 23:40 / eli-b
Sodium	162	mg/L	D	8		E200.7	06/12/18 23:40 / eli-b
PHYSICAL PROPERTIES							
pH	8.01	s.u.	H	0.01		A4500-H B	05/25/18 08:34 / mvr
pH Measurement Temp	15	°C				A4500-H B	05/25/18 08:34 / mvr
Solids, Total Dissolved TDS @ 180 C	781	mg/L		10		A2540 C	05/25/18 15:42 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.43	mg/L		0.01		E353.2	05/25/18 15:58 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/07/18 21:15 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Boron	3.49	mg/L		0.05		E200.7	06/07/18 14:07 / eli-b
Cadmium	0.002	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Chromium	0.001	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Cobalt	0.011	mg/L		0.005		E200.8	06/07/18 21:15 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 23:40 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/11/18 15:50 / eli-b
Molybdenum	0.157	mg/L		0.001		E200.8	06/07/18 21:15 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 12:38 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:38 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.3	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 precision (±)	0.1	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 228	2.1	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.2	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	2.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-013
Client Sample ID: DJ-44

Report Date: 06/20/18
Collection Date: 05/23/18 18:40
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.2	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-014
Client Sample ID: DJ-12R

Report Date: 06/20/18
Collection Date: 05/23/18 19:25
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	92	mg/L		5		A2320 B	05/26/18 01:15 / ljl
Carbonate as CO3	48	mg/L		5		A2320 B	05/26/18 01:15 / ljl
Bicarbonate as HCO3	ND	mg/L		5		A2320 B	05/26/18 01:15 / ljl
Chloride	24	mg/L		1		E300.0	05/26/18 01:52 / ljl
Fluoride	1.0	mg/L		0.1		A4500-F C	05/30/18 11:17 / ljl
Sulfate	361	mg/L	D	2		E300.0	05/26/18 01:52 / ljl
Calcium	70	mg/L		1		E200.7	06/07/18 14:11 / eli-b
Magnesium	6	mg/L		1		E200.7	06/07/18 14:11 / eli-b
Potassium	22	mg/L		1		E200.7	06/12/18 23:44 / eli-b
Sodium	174	mg/L	D	8		E200.7	06/12/18 23:44 / eli-b
PHYSICAL PROPERTIES							
pH	11.2	s.u.	H	0.01		A4500-H B	05/25/18 08:36 / mvr
pH Measurement Temp	15	°C				A4500-H B	05/25/18 08:36 / mvr
Solids, Total Dissolved TDS @ 180 C	773	mg/L		10		A2540 C	05/25/18 15:42 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.63	mg/L		0.01		E353.2	05/25/18 15:59 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Arsenic	0.008	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/07/18 21:20 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Boron	1.28	mg/L		0.05		E200.7	06/07/18 14:11 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 21:20 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 23:44 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:32 / eli-b
Molybdenum	0.056	mg/L		0.001		E200.8	06/07/18 21:20 / eli-b
Selenium	0.007	mg/L		0.001		E200.8	06/09/18 12:42 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:42 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.1	pCi/L	U			E903.0	06/12/18 12:06 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 228	1.3	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.3	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.3	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	1.4	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-014
Client Sample ID: DJ-12R

Report Date: 06/20/18
Collection Date: 05/23/18 19:25
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.3	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-015
Client Sample ID: DJ-43

Report Date: 06/20/18
Collection Date: 05/23/18 19:00
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	98	mg/L		5		A2320 B	05/26/18 01:22 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 01:22 / ljl
Bicarbonate as HCO3	120	mg/L		5		A2320 B	05/26/18 01:22 / ljl
Chloride	33	mg/L		1		E300.0	05/26/18 02:11 / ljl
Fluoride	3.5	mg/L		0.1		A4500-F C	05/30/18 11:19 / ljl
Sulfate	378	mg/L	D	2		E300.0	05/26/18 02:11 / ljl
Calcium	32	mg/L		1		E200.7	06/07/18 14:15 / eli-b
Magnesium	3	mg/L		1		E200.7	06/07/18 14:15 / eli-b
Potassium	9	mg/L		1		E200.7	06/12/18 23:47 / eli-b
Sodium	216	mg/L	D	8		E200.7	06/12/18 23:47 / eli-b
PHYSICAL PROPERTIES							
pH	8.19	s.u.	H	0.01		A4500-H B	05/25/18 08:39 / mvr
pH Measurement Temp	15	°C				A4500-H B	05/25/18 08:39 / mvr
Solids, Total Dissolved TDS @ 180 C	786	mg/L		10		A2540 C	05/25/18 15:42 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.86	mg/L		0.01		E353.2	05/25/18 16:00 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Arsenic	0.003	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Barium	0.06	mg/L		0.05		E200.8	06/07/18 21:24 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Boron	1.84	mg/L		0.05		E200.7	06/07/18 14:15 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Chromium	0.004	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Cobalt	0.006	mg/L		0.005		E200.8	06/07/18 21:24 / eli-b
Lead	0.003	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 23:47 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:33 / eli-b
Molybdenum	0.471	mg/L		0.001		E200.8	06/07/18 21:24 / eli-b
Selenium	0.001	mg/L		0.001		E200.8	06/09/18 12:47 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:47 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.3	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:06 / arh
Radium 228	0.9	pCi/L	U			RA-05	06/07/18 11:00 / plj
Radium 228 precision (±)	1.5	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 228 MDC	2.4	pCi/L				RA-05	06/07/18 11:00 / plj
Radium 226 + Radium 228	1.2	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.5	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-015
Client Sample ID: DJ-43

Report Date: 06/20/18
Collection Date: 05/23/18 19:00
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.4	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-016
Client Sample ID: DUP-1

Report Date: 06/20/18
Collection Date: 05/23/18 17:25
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	210	mg/L		5		A2320 B	05/26/18 01:30 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 01:30 / ljl
Bicarbonate as HCO3	256	mg/L		5		A2320 B	05/26/18 01:30 / ljl
Chloride	43	mg/L		1		E300.0	05/26/18 02:30 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	05/30/18 11:22 / ljl
Sulfate	398	mg/L	D	2		E300.0	05/26/18 02:30 / ljl
Calcium	129	mg/L		1		E200.7	06/07/18 14:19 / eli-b
Magnesium	46	mg/L		1		E200.7	06/07/18 14:19 / eli-b
Potassium	6	mg/L		1		E200.7	06/12/18 23:59 / eli-b
Sodium	89	mg/L	D	8		E200.7	06/12/18 23:59 / eli-b
PHYSICAL PROPERTIES							
pH	7.66	s.u.	H	0.01		A4500-H B	05/25/18 08:42 / mvr
pH Measurement Temp	15	°C				A4500-H B	05/25/18 08:42 / mvr
Solids, Total Dissolved TDS @ 180 C	906	mg/L		10		A2540 C	05/25/18 15:42 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.01		E353.2	05/25/18 16:02 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Barium	0.06	mg/L		0.05		E200.8	06/07/18 21:28 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Boron	0.10	mg/L		0.05		E200.7	06/07/18 14:19 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 21:28 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 23:59 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:35 / eli-b
Molybdenum	0.002	mg/L		0.001		E200.8	06/07/18 21:28 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 12:52 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 12:52 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.7	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 228	2.5	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 MDC	1.8	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 226 + Radium 228	3.2	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-016
Client Sample ID: DUP-1

Report Date: 06/20/18
Collection Date: 05/23/18 17:25
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-017
Client Sample ID: FB-1

Report Date: 06/20/18
Collection Date: 05/23/18 17:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	ND	mg/L		5		A2320 B	05/26/18 01:34 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 01:34 / ljl
Bicarbonate as HCO3	ND	mg/L		5		A2320 B	05/26/18 01:34 / ljl
Chloride	ND	mg/L		1		E300.0	05/26/18 02:49 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	05/30/18 11:27 / ljl
Sulfate	ND	mg/L		1		E300.0	05/26/18 02:49 / ljl
Calcium	ND	mg/L		1		E200.7	06/07/18 14:23 / eli-b
Magnesium	ND	mg/L		1		E200.7	06/07/18 14:23 / eli-b
Potassium	ND	mg/L		1		E200.7	06/13/18 00:03 / eli-b
Sodium	ND	mg/L		1		E200.7	06/12/18 01:16 / eli-b
PHYSICAL PROPERTIES							
pH	6.17	s.u.	H	0.01		A4500-H B	05/25/18 08:45 / mvr
pH Measurement Temp	16	°C				A4500-H B	05/25/18 08:45 / mvr
Solids, Total Dissolved TDS @ 180 C	17	mg/L		10		A2540 C	05/25/18 15:42 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.01		E353.2	05/25/18 16:03 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/07/18 21:32 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Boron	ND	mg/L		0.05		E200.7	06/07/18 14:23 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/07/18 21:32 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/13/18 00:03 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:37 / eli-b
Molybdenum	ND	mg/L		0.001		E200.8	06/07/18 21:32 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 13:28 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 13:28 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.2	pCi/L	U			E903.0	06/12/18 12:02 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 MDC	0.4	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 228	0.4	pCi/L	U			RA-05	06/07/18 13:37 / plj
Radium 228 precision (±)	1.7	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 MDC	2.8	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 226 + Radium 228	0.5	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.7	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-017
Client Sample ID: FB-1

Report Date: 06/20/18
Collection Date: 05/23/18 17:30
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	2.8	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-018
Client Sample ID: DJ-37

Report Date: 06/20/18
Collection Date: 05/24/18 08:20
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	309	mg/L		5		A2320 B	05/26/18 01:43 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 01:43 / ljl
Bicarbonate as HCO3	377	mg/L		5		A2320 B	05/26/18 01:43 / ljl
Chloride	56	mg/L		1		E300.0	05/26/18 03:08 / ljl
Fluoride	0.6	mg/L		0.1		A4500-F C	05/30/18 11:30 / ljl
Sulfate	1330	mg/L	D	4		E300.0	05/26/18 03:08 / ljl
Calcium	464	mg/L		1		E200.7	06/07/18 14:27 / eli-b
Magnesium	104	mg/L		1		E200.7	06/07/18 14:27 / eli-b
Potassium	10	mg/L		1		E200.7	06/12/18 01:55 / eli-b
Sodium	126	mg/L	D	4		E200.7	06/12/18 01:55 / eli-b
PHYSICAL PROPERTIES							
pH	7.36	s.u.	H	0.01		A4500-H B	05/25/18 08:48 / mvr
pH Measurement Temp	16	°C				A4500-H B	05/25/18 08:48 / mvr
Solids, Total Dissolved TDS @ 180 C	2420	mg/L	D	20		A2540 C	05/25/18 15:43 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.45	mg/L		0.01		E353.2	05/25/18 16:04 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Arsenic	ND	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/07/18 21:36 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Boron	4.41	mg/L	D	0.09		E200.7	06/12/18 01:55 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Cobalt	0.013	mg/L		0.005		E200.8	06/07/18 21:36 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/12/18 01:55 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:39 / eli-b
Molybdenum	0.020	mg/L		0.001		E200.8	06/07/18 21:36 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/09/18 13:32 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/09/18 13:32 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 228	0.6	pCi/L	U			RA-05	06/07/18 13:37 / plj
Radium 228 precision (±)	1	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 MDC	1.6	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 226 + Radium 228	1	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.0	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-018
Client Sample ID: DJ-37

Report Date: 06/20/18
Collection Date: 05/24/18 08:20
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.6	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-019
Client Sample ID: DJ-36

Report Date: 06/20/18
Collection Date: 05/24/18 09:10
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	92	mg/L		5		A2320 B	05/26/18 02:11 / ljl
Carbonate as CO3	ND	mg/L		5		A2320 B	05/26/18 02:11 / ljl
Bicarbonate as HCO3	112	mg/L		5		A2320 B	05/26/18 02:11 / ljl
Chloride	29	mg/L		1		E300.0	05/26/18 03:28 / ljl
Fluoride	1.4	mg/L		0.1		A4500-F C	05/30/18 11:40 / ljl
Sulfate	555	mg/L	D	2		E300.0	05/26/18 03:28 / ljl
Calcium	140	mg/L		1		E200.7	06/07/18 14:57 / eli-b
Magnesium	38	mg/L		1		E200.7	06/07/18 14:57 / eli-b
Potassium	11	mg/L		1		E200.7	06/07/18 21:04 / eli-b
Sodium	104	mg/L	D	4		E200.7	06/07/18 21:04 / eli-b
PHYSICAL PROPERTIES							
pH	7.82	s.u.	H	0.01		A4500-H B	05/25/18 08:51 / mvr
pH Measurement Temp	16	°C				A4500-H B	05/25/18 08:51 / mvr
Solids, Total Dissolved TDS @ 180 C	1040	mg/L		10		A2540 C	05/25/18 15:43 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.04	mg/L		0.01		E353.2	05/25/18 16:05 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Arsenic	0.006	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Barium	0.18	mg/L		0.05		E200.8	06/02/18 16:50 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Boron	1.40	mg/L		0.05		E200.7	06/07/18 14:57 / eli-b
Cadmium	0.011	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Chromium	0.016	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Cobalt	0.080	mg/L		0.005		E200.8	06/02/18 16:50 / eli-b
Lead	0.015	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 21:04 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:41 / eli-b
Molybdenum	0.034	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/02/18 16:50 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/04/18 16:41 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	1.0	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 precision (±)	0.3	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 228	5.0	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 precision (±)	1.5	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 MDC	1.6	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 226 + Radium 228	6.0	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.5	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-019
Client Sample ID: DJ-36

Report Date: 06/20/18
Collection Date: 05/24/18 09:10
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.6	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-020
Client Sample ID: DJ-40

Report Date: 06/20/18
Collection Date: 05/24/18 09:40
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	78	mg/L		5		A2320 B	05/26/18 02:27 / ljl
Carbonate as CO3	9	mg/L		5		A2320 B	05/26/18 02:27 / ljl
Bicarbonate as HCO3	77	mg/L		5		A2320 B	05/26/18 02:27 / ljl
Chloride	19	mg/L		1		E300.0	05/26/18 03:47 / ljl
Fluoride	1.1	mg/L		0.1		A4500-F C	05/30/18 11:43 / ljl
Sulfate	352	mg/L		1		E300.0	05/26/18 03:47 / ljl
Calcium	85	mg/L		1		E200.7	06/07/18 15:31 / eli-b
Magnesium	12	mg/L		1		E200.7	06/07/18 15:31 / eli-b
Potassium	18	mg/L		1		E200.7	06/07/18 15:31 / eli-b
Sodium	91	mg/L		1		E200.7	06/07/18 15:31 / eli-b
PHYSICAL PROPERTIES							
pH	9.13	s.u.	H	0.01		A4500-H B	05/25/18 08:54 / mvr
pH Measurement Temp	16	°C				A4500-H B	05/25/18 08:54 / mvr
Solids, Total Dissolved TDS @ 180 C	689	mg/L		10		A2540 C	05/25/18 15:43 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.34	mg/L		0.01		E353.2	05/25/18 16:09 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Arsenic	0.002	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/02/18 16:55 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Boron	1.37	mg/L		0.05		E200.7	06/07/18 15:31 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	06/02/18 16:55 / eli-b
Lead	ND	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 21:08 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:43 / eli-b
Molybdenum	0.045	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	06/02/18 16:55 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/04/18 16:43 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.4	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 228	0.9	pCi/L	U			RA-05	06/07/18 13:37 / plj
Radium 228 precision (±)	1.1	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 MDC	1.7	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 226 + Radium 228	1.3	pCi/L	U			A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-020
Client Sample ID: DJ-40

Report Date: 06/20/18
Collection Date: 05/24/18 09:40
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.7	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-021
Client Sample ID: DJ-35

Report Date: 06/20/18
Collection Date: 05/24/18 10:10
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	151	mg/L		5		A2320 B	05/26/18 02:36 / ljl
Carbonate as CO3	20	mg/L		5		A2320 B	05/26/18 02:36 / ljl
Bicarbonate as HCO3	144	mg/L		5		A2320 B	05/26/18 02:36 / ljl
Chloride	25	mg/L		1		E300.0	05/26/18 04:44 / ljl
Fluoride	2.5	mg/L		0.1		A4500-F C	05/30/18 11:45 / ljl
Sulfate	537	mg/L	D	2		E300.0	05/26/18 04:44 / ljl
Calcium	65	mg/L		1		E200.7	06/07/18 21:12 / eli-b
Magnesium	27	mg/L		1		E200.7	06/07/18 21:12 / eli-b
Potassium	3	mg/L		1		E200.7	06/07/18 21:12 / eli-b
Sodium	216	mg/L	D	4		E200.7	06/07/18 21:12 / eli-b
PHYSICAL PROPERTIES							
pH	8.99	s.u.	H	0.01		A4500-H B	05/25/18 09:06 / mvr
pH Measurement Temp	16	°C				A4500-H B	05/25/18 09:06 / mvr
Solids, Total Dissolved TDS @ 180 C	1060	mg/L		10		A2540 C	05/25/18 15:43 / mvr
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.01		E353.2	05/25/18 16:12 / dmb
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Arsenic	0.014	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Barium	ND	mg/L		0.05		E200.8	06/02/18 17:00 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Boron	2.71	mg/L	D	0.09		E200.7	06/07/18 21:12 / eli-b
Cadmium	0.001	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Chromium	ND	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Cobalt	0.039	mg/L		0.005		E200.8	06/02/18 17:00 / eli-b
Lead	0.001	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Lithium	ND	mg/L		0.1		E200.7	06/07/18 21:12 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	06/14/18 10:45 / eli-b
Molybdenum	0.097	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Selenium	ND	mg/L		0.001		E200.8	06/02/18 17:00 / eli-b
Thallium	ND	mg/L		0.0005		E200.8	06/04/18 16:46 / eli-b
RADIONUCLIDES, TOTAL							
Radium 226	0.3	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 precision (±)	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 226 MDC	0.2	pCi/L				E903.0	06/12/18 12:02 / arh
Radium 228	2.3	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 precision (±)	1.2	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 228 MDC	1.7	pCi/L				RA-05	06/07/18 13:37 / plj
Radium 226 + Radium 228	2.5	pCi/L				A7500-RA	06/14/18 14:44 / dmf
Radium 226 + Radium 228 precision (±)	1.2	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: PacifiCorp
Project: PERCM50
Lab ID: C18050869-021
Client Sample ID: DJ-35

Report Date: 06/20/18
Collection Date: 05/24/18 10:10
DateReceived: 05/24/18
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Radium 226 + Radium 228 MDC	1.7	pCi/L				A7500-RA	06/14/18 14:44 / dmf

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP203-B_180607A	
Lab ID: ICV	6	Continuing Calibration Verification Standard							06/07/18 11:52	
Boron		2.51	mg/L	0.10	100	95	105			
Calcium		24.6	mg/L	1.0	99	95	105			
Lithium		1.24	mg/L	0.10	99	95	105			
Magnesium		24.8	mg/L	1.0	99	95	105			
Potassium		25.3	mg/L	1.0	101	95	105			
Sodium		25.1	mg/L	1.0	100	95	105			
Method: E200.7									Batch: 121998	
Lab ID: MB-121998	6	Method Blank				Run: ICP203-B_180607A			06/07/18 20:49	
Boron		ND	mg/L	0.02						
Calcium		ND	mg/L	0.09						
Lithium		ND	mg/L	0.007						
Magnesium		ND	mg/L	0.03						
Potassium		ND	mg/L	0.05						
Sodium		ND	mg/L	0.8						
Lab ID: LCS-121998	6	Laboratory Control Sample				Run: ICP203-B_180607A			06/07/18 20:53	
Boron		0.518	mg/L	0.050	104	85	115			
Calcium		25.1	mg/L	1.0	100	85	115			
Lithium		0.532	mg/L	0.10	106	85	115			
Magnesium		25.1	mg/L	1.0	101	85	115			
Potassium		27.0	mg/L	1.0	108	85	115			
Sodium		25.4	mg/L	1.0	102	85	115			
Lab ID: B18052675-004BMS3	6	Sample Matrix Spike				Run: ICP203-B_180607A			06/07/18 21:51	
Boron		0.584	mg/L	0.050	117	70	130			
Calcium		31.4	mg/L	1.0	125	70	130			
Lithium		0.534	mg/L	0.10	107	70	130			
Magnesium		27.3	mg/L	1.0	109	70	130			
Potassium		27.1	mg/L	1.0	109	70	130			
Sodium		32.0	mg/L	1.0	128	70	130			
Lab ID: B18052675-004BMSD	6	Sample Matrix Spike Duplicate				Run: ICP203-B_180607A			06/07/18 21:55	
Boron		0.564	mg/L	0.050	113	70	130	3.5	20	
Calcium		30.1	mg/L	1.0	120	70	130	4.3	20	
Lithium		0.516	mg/L	0.10	103	70	130	3.4	20	
Magnesium		26.4	mg/L	1.0	105	70	130	3.3	20	
Potassium		26.4	mg/L	1.0	105	70	130	2.9	20	
Sodium		30.9	mg/L	1.0	123	70	130	3.6	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP203-B_180611A	
Lab ID: ICV	4	Continuing Calibration Verification Standard							06/11/18 09:37	
Boron		2.45	mg/L	0.10	98	95	105			
Lithium		1.29	mg/L	0.10	103	95	105			
Potassium		25.9	mg/L	1.0	104	95	105			
Sodium		26.0	mg/L	1.0	104	95	105			
Method: E200.7									Batch: 121995	
Lab ID: MB-121995	7	Method Blank				Run: ICP203-B_180611A			06/12/18 00:02	
Barium		ND	mg/L	0.007						
Boron		ND	mg/L	0.02						
Calcium		ND	mg/L	0.09						
Lithium		ND	mg/L	0.007						
Magnesium		ND	mg/L	0.03						
Potassium		ND	mg/L	0.05						
Sodium		ND	mg/L	0.8						
Lab ID: LCS-121995	7	Laboratory Control Sample				Run: ICP203-B_180611A			06/12/18 00:06	
Barium		0.490	mg/L	0.050	98	85	115			
Boron		0.520	mg/L	0.050	104	85	115			
Calcium		26.6	mg/L	1.0	107	85	115			
Lithium		0.459	mg/L	0.10	92	85	115			
Magnesium		24.6	mg/L	1.0	98	85	115			
Potassium		23.4	mg/L	1.0	94	85	115			
Sodium		24.0	mg/L	1.0	96	85	115			
Lab ID: C18050869-010BMS3	7	Sample Matrix Spike				Run: ICP203-B_180611A			06/12/18 00:44	
Barium		0.545	mg/L	0.050	98	70	130			
Boron		0.620	mg/L	0.050	104	70	130			
Calcium		159	mg/L	1.0		70	130			A
Lithium		0.493	mg/L	0.10	89	70	130			
Magnesium		68.2	mg/L	1.0	100	70	130			
Potassium		28.7	mg/L	1.0	91	70	130			
Sodium		106	mg/L	1.6	94	70	130			
Lab ID: C18050869-010BMSD	7	Sample Matrix Spike Duplicate				Run: ICP203-B_180611A			06/12/18 00:48	
Barium		0.538	mg/L	0.050	97	70	130	1.3	20	
Boron		0.606	mg/L	0.050	101	70	130	2.2	20	
Calcium		154	mg/L	1.0		70	130	3.3	20	A
Lithium		0.481	mg/L	0.10	87	70	130	2.5	20	
Magnesium		66.2	mg/L	1.0	92	70	130	2.9	20	
Potassium		28.0	mg/L	1.0	88	70	130	2.6	20	
Sodium		102	mg/L	1.6	77	70	130	3.9	20	
Lab ID: C18050869-018BMS3	7	Sample Matrix Spike				Run: ICP203-B_180611A			06/12/18 02:03	
Barium		0.526	mg/L	0.050	105	70	130			
Boron		4.88	mg/L	0.090		70	130			A
Calcium		473	mg/L	1.0		70	130			A

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.7**									Batch: 121995	
Lab ID: **C18050869-018BMS3**	7	Sample Matrix Spike				Run: ICP203-B_180611A			06/12/18 02:03	
Lithium		0.554	mg/L	0.10	103	70	130			
Magnesium		127	mg/L	1.0		70	130			A
Potassium		35.9	mg/L	1.0	104	70	130			
Sodium		147	mg/L	3.9		70	130			A
Lab ID: **C18050869-018BMSD**	7	Sample Matrix Spike Duplicate				Run: ICP203-B_180611A			06/12/18 02:06	
Barium		0.525	mg/L	0.050	105	70	130	0.2	20	
Boron		4.97	mg/L	0.090		70	130	1.9	20	A
Calcium		482	mg/L	1.0		70	130	1.9	20	A
Lithium		0.551	mg/L	0.10	102	70	130	0.7	20	
Magnesium		130	mg/L	1.0		70	130	2.6	20	A
Potassium		35.8	mg/L	1.0	103	70	130	0.3	20	
Sodium		150	mg/L	3.9		70	130	2.0	20	A

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP204-B_180607B	
Lab ID: ICV	7	Continuing Calibration Verification Standard							06/07/18 11:36	
Barium		2.46	mg/L	0.10	98	95	105			
Boron		2.48	mg/L	0.10	99	95	105			
Calcium		25.0	mg/L	1.0	100	95	105			
Lithium		1.26	mg/L	0.10	100	95	105			
Magnesium		25.1	mg/L	1.0	100	95	105			
Potassium		25.1	mg/L	1.0	100	95	105			
Sodium		25.0	mg/L	1.0	100	95	105			
Method: E200.7									Batch: 121995	
Lab ID: MB-121995	7	Method Blank				Run: ICP204-B_180607B			06/07/18 12:43	
Barium		ND	mg/L	0.007						
Boron		ND	mg/L	0.02						
Calcium		ND	mg/L	0.09						
Lithium		ND	mg/L	0.007						
Magnesium		ND	mg/L	0.03						
Potassium		ND	mg/L	0.05						
Sodium		ND	mg/L	0.8						
Lab ID: LCS-121995	7	Laboratory Control Sample				Run: ICP204-B_180607B			06/07/18 12:47	
Barium		0.530	mg/L	0.050	106	85	115			
Boron		0.535	mg/L	0.050	107	85	115			
Calcium		27.2	mg/L	1.0	109	85	115			
Lithium		0.535	mg/L	0.10	107	85	115			
Magnesium		26.9	mg/L	1.0	108	85	115			
Potassium		27.5	mg/L	1.0	110	85	115			
Sodium		27.0	mg/L	1.0	108	85	115			
Lab ID: C18050869-010BMS3	7	Sample Matrix Spike				Run: ICP204-B_180607B			06/07/18 13:44	
Barium		0.576	mg/L	0.050	104	70	130			
Boron		0.616	mg/L	0.050	102	70	130			
Calcium		159	mg/L	1.0		70	130			A
Lithium		0.558	mg/L	0.10	102	70	130			
Magnesium		74.9	mg/L	1.0	120	70	130			
Potassium		32.6	mg/L	1.0	106	70	130			
Sodium		117	mg/L	1.6	117	70	130			
Lab ID: C18050869-010BMSD	7	Sample Matrix Spike Duplicate				Run: ICP204-B_180607B			06/07/18 13:48	
Barium		0.567	mg/L	0.050	102	70	130	1.6	20	
Boron		0.609	mg/L	0.050	101	70	130	1.1	20	
Calcium		153	mg/L	1.0		70	130	3.8	20	A
Lithium		0.543	mg/L	0.10	98	70	130	2.8	20	
Magnesium		72.3	mg/L	1.0	110	70	130	3.6	20	
Potassium		31.6	mg/L	1.0	102	70	130	3.0	20	
Sodium		112	mg/L	1.6	98	70	130	4.0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Batch: 121995	
Lab ID: C18050869-018BMS3	7	Sample Matrix Spike			Run: ICP204-B_180607B				06/07/18 14:35	
Barium		0.529	mg/L	0.050	106	70	130			
Boron		4.76	mg/L	0.090		70	130			A
Calcium		485	mg/L	1.0		70	130			A
Lithium		0.521	mg/L	0.10	97	70	130			
Magnesium		130	mg/L	1.0		70	130			A
Potassium		34.0	mg/L	1.0	102	70	130			
Sodium		147	mg/L	3.9		70	130			A
Lab ID: C18050869-018BMSD	7	Sample Matrix Spike Duplicate			Run: ICP204-B_180607B				06/07/18 14:38	
Barium		0.480	mg/L	0.050	96	70	130	9.7	20	
Boron		4.49	mg/L	0.090		70	130	6.0	20	A
Calcium		487	mg/L	1.0		70	130	0.4	20	A
Lithium		0.449	mg/L	0.10	82	70	130	15	20	
Magnesium		130	mg/L	1.0		70	130	0.3	20	A
Potassium		30.2	mg/L	1.0	87	70	130	12	20	
Sodium		137	mg/L	3.9		70	130	7.1	20	A
Method: E200.7									Batch: 121998	
Lab ID: MB-121998	5	Method Blank			Run: ICP204-B_180607B				06/07/18 14:50	
Boron		ND	mg/L	0.02						
Calcium		ND	mg/L	0.09						
Magnesium		ND	mg/L	0.03						
Potassium		ND	mg/L	0.05						
Sodium		ND	mg/L	0.8						
Lab ID: LCS-121998	5	Laboratory Control Sample			Run: ICP204-B_180607B				06/07/18 14:54	
Boron		0.481	mg/L	0.050	96	85	115			
Calcium		26.6	mg/L	1.0	107	85	115			
Magnesium		26.0	mg/L	1.0	104	85	115			
Potassium		22.1	mg/L	1.0	89	85	115			
Sodium		23.4	mg/L	1.0	94	85	115			
Lab ID: B18052675-004BMS3	5	Sample Matrix Spike			Run: ICP204-B_180607B				06/07/18 16:05	
Boron		0.607	mg/L	0.050	121	70	130			
Calcium		32.3	mg/L	1.0	129	70	130			
Magnesium		28.4	mg/L	1.0	113	70	130			
Potassium		30.2	mg/L	1.0	121	70	130			
Sodium		34.4	mg/L	1.0	138	70	130			S
Lab ID: B18052675-004BMSD	5	Sample Matrix Spike Duplicate			Run: ICP204-B_180607B				06/07/18 16:17	
Boron		0.573	mg/L	0.050	115	70	130	5.8	20	
Calcium		31.3	mg/L	1.0	125	70	130	3.3	20	
Magnesium		27.5	mg/L	1.0	110	70	130	3.3	20	
Potassium		28.8	mg/L	1.0	115	70	130	4.9	20	
Sodium		33.2	mg/L	1.0	133	70	130	3.7	20	S

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7									Analytical Run: ICP204-B_180608B	
Lab ID: ICV	2	Continuing Calibration Verification Standard							06/08/18 10:01	
Lithium		1.31	mg/L	0.10	105	95	105			
Sodium		26.0	mg/L	1.0	104	95	105			
Method: E200.7									Batch: 121995	
Lab ID: MB-121995	7	Method Blank				Run: ICP204-B_180608B			06/08/18 19:25	
Barium		ND	mg/L	0.007						
Boron		ND	mg/L	0.02						
Calcium		ND	mg/L	0.09						
Lithium		ND	mg/L	0.007						
Magnesium		ND	mg/L	0.03						
Potassium		ND	mg/L	0.05						
Sodium		ND	mg/L	0.8						
Lab ID: LCS-121995	7	Laboratory Control Sample				Run: ICP204-B_180608B			06/08/18 19:29	
Barium		0.510	mg/L	0.050	102	85	115			
Boron		0.526	mg/L	0.050	105	85	115			
Calcium		26.2	mg/L	1.0	105	85	115			
Lithium		0.511	mg/L	0.10	102	85	115			
Magnesium		26.1	mg/L	1.0	104	85	115			
Potassium		25.7	mg/L	1.0	103	85	115			
Sodium		26.0	mg/L	1.0	104	85	115			
Lab ID: C18050869-010BMS3	7	Sample Matrix Spike				Run: ICP204-B_180608B			06/08/18 20:06	
Barium		0.534	mg/L	0.050	97	70	130			
Boron		0.576	mg/L	0.090	115	70	130			
Calcium		151	mg/L	1.0		70	130			A
Lithium		0.533	mg/L	0.10	97	70	130			
Magnesium		71.2	mg/L	1.0	116	70	130			
Potassium		30.3	mg/L	1.0	99	70	130			
Sodium		110	mg/L	3.9	124	70	130			
Lab ID: C18050869-010BMSD	7	Sample Matrix Spike Duplicate				Run: ICP204-B_180608B			06/08/18 20:10	
Barium		0.498	mg/L	0.050	90	70	130	7.0	20	
Boron		0.558	mg/L	0.090	112	70	130	3.2	20	
Calcium		140	mg/L	1.0		70	130	8.0	20	A
Lithium		0.496	mg/L	0.10	90	70	130	7.3	20	
Magnesium		66.1	mg/L	1.0	96	70	130	7.4	20	
Potassium		28.2	mg/L	1.0	91	70	130	7.2	20	
Sodium		100	mg/L	3.9	87	70	130	8.8	20	
Lab ID: C18050869-018BMS3	7	Sample Matrix Spike				Run: ICP204-B_180608B			06/08/18 21:30	
Barium		0.562	mg/L	0.050	112	70	130			
Boron		5.11	mg/L	0.090		70	130			A
Calcium		475	mg/L	1.0		70	130			A
Lithium		0.597	mg/L	0.10	111	70	130			
Magnesium		129	mg/L	1.0		70	130			A

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.7**									Batch: 121995	
Lab ID: **C18050869-018BMS3**	7	Sample Matrix Spike				Run: ICP204-B_180608B			06/08/18 21:30	
Potassium		37.1	mg/L	1.0	109	70	130			
Sodium		156	mg/L	3.9		70	130			A
Lab ID: **C18050869-018BMSD**	7	Sample Matrix Spike Duplicate				Run: ICP204-B_180608B			06/08/18 21:33	
Barium		0.601	mg/L	0.050	120	70	130	6.7	20	
Boron		5.49	mg/L	0.090		70	130	7.2	20	A
Calcium		502	mg/L	1.0		70	130	5.5	20	A
Lithium		0.635	mg/L	0.10	119	70	130	6.2	20	
Magnesium		135	mg/L	1.0		70	130	4.6	20	A
Potassium		39.2	mg/L	1.0	118	70	130	5.6	20	
Sodium		167	mg/L	3.9		70	130	7.0	20	A
Method: **E200.7**									Analytical Run: ICP204-B_180612A	
Lab ID: **ICV**	3	Continuing Calibration Verification Standard							06/12/18 12:05	
Lithium		1.31	mg/L	0.10	105	95	105			
Potassium		26.2	mg/L	1.0	105	95	105			
Sodium		26.1	mg/L	1.0	104	95	105			
Method: **E200.7**									Batch: 121995	
Lab ID: **MB-121995**	3	Method Blank				Run: ICP204-B_180612A			06/12/18 23:01	
Lithium		ND	mg/L	0.007						
Potassium		ND	mg/L	0.05						
Sodium		ND	mg/L	0.8						

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS202-B_180604B	
Lab ID: QCS	Initial Calibration Verification Standard								06/04/18 15:02	
Thallium		0.0500	mg/L	0.10	100	90	110			
Method: E200.8									Batch: 121998	
Lab ID: MB-121998	11 Method Blank					Run: ICPMS202-B_180604B			06/04/18 16:27	
Antimony		ND	mg/L	0.00004						
Arsenic		ND	mg/L	0.00006						
Barium		ND	mg/L	0.00004						
Beryllium		ND	mg/L	0.00002						
Cadmium		0.00002	mg/L	0.00002						
Chromium		0.0008	mg/L	0.00009						
Cobalt		ND	mg/L	0.00003						
Lead		0.0002	mg/L	0.00005						
Molybdenum		ND	mg/L	0.00005						
Selenium		0.0003	mg/L	0.0002						
Thallium		ND	mg/L	0.0001						
Lab ID: LCS-121998	11 Laboratory Control Sample					Run: ICPMS202-B_180604B			06/04/18 16:57	
Antimony		0.533	mg/L	0.0050	107	85	115			
Arsenic		0.532	mg/L	0.0010	106	85	115			
Barium		0.505	mg/L	0.010	101	85	115			
Beryllium		0.252	mg/L	0.0010	101	85	115			
Cadmium		0.249	mg/L	0.0010	100	85	115			
Chromium		0.516	mg/L	0.0010	103	85	115			
Cobalt		0.511	mg/L	0.0010	102	85	115			
Lead		0.512	mg/L	0.0010	102	85	115			
Molybdenum		0.511	mg/L	0.0050	102	85	115			
Selenium		0.506	mg/L	0.0050	101	85	115			
Thallium		0.497	mg/L	0.0010	99	85	115			
Lab ID: B18052675-004BMS3	11 Sample Matrix Spike					Run: ICPMS202-B_180604B			06/04/18 17:21	
Antimony		0.536	mg/L	0.0010	107	70	130			
Arsenic		0.531	mg/L	0.0010	106	70	130			
Barium		0.523	mg/L	0.050	105	70	130			
Beryllium		0.253	mg/L	0.0010	101	70	130			
Cadmium		0.249	mg/L	0.0010	100	70	130			
Chromium		0.510	mg/L	0.0050	102	70	130			
Cobalt		0.521	mg/L	0.0050	104	70	130			
Lead		0.529	mg/L	0.0010	106	70	130			
Molybdenum		0.515	mg/L	0.0010	103	70	130			
Selenium		0.490	mg/L	0.0010	98	70	130			
Thallium		0.513	mg/L	0.00050	103	70	130			
Lab ID: B18052675-004BMSD	11 Sample Matrix Spike Duplicate					Run: ICPMS202-B_180604B			06/04/18 17:34	
Antimony		0.519	mg/L	0.0010	104	70	130	3.1	20	
Arsenic		0.511	mg/L	0.0010	102	70	130	3.9	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.8**									Batch: 121998	
Lab ID: **B18052675-004BMSD**	11	Sample Matrix Spike Duplicate				Run: ICPMS202-B_180604B			06/04/18 17:34	
Barium		0.499	mg/L	0.050	100	70	130	4.6	20	
Beryllium		0.242	mg/L	0.0010	97	70	130	4.2	20	
Cadmium		0.240	mg/L	0.0010	96	70	130	3.6	20	
Chromium		0.485	mg/L	0.0050	97	70	130	4.8	20	
Cobalt		0.497	mg/L	0.0050	99	70	130	4.7	20	
Lead		0.508	mg/L	0.0010	102	70	130	4.1	20	
Molybdenum		0.499	mg/L	0.0010	100	70	130	3.0	20	
Selenium		0.475	mg/L	0.0010	95	70	130	3.2	20	
Thallium		0.493	mg/L	0.00050	99	70	130	3.9	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS206-B_180601A	
Lab ID: QCS	10	Initial Calibration Verification Standard							06/02/18 14:14	
Antimony		0.0483	mg/L	0.050	97	90	110			
Arsenic		0.0498	mg/L	0.0050	100	90	110			
Barium		0.0487	mg/L	0.10	97	90	110			
Beryllium		0.0243	mg/L	0.0010	97	90	110			
Cadmium		0.0243	mg/L	0.0010	97	90	110			
Chromium		0.0501	mg/L	0.010	100	90	110			
Cobalt		0.0508	mg/L	0.010	102	90	110			
Lead		0.0486	mg/L	0.010	97	90	110			
Molybdenum		0.0462	mg/L	0.0050	92	90	110			
Selenium		0.0496	mg/L	0.0050	99	90	110			
Method: E200.8									Batch: 121998	
Lab ID: MB-121998	11	Method Blank				Run: ICPMS206-B_180601A			06/02/18 16:36	
Antimony		ND	mg/L	0.0004						
Arsenic		ND	mg/L	0.0001						
Barium		ND	mg/L	0.00009						
Beryllium		ND	mg/L	0.0001						
Cadmium		ND	mg/L	0.00003						
Chromium		ND	mg/L	0.0002						
Cobalt		ND	mg/L	0.00004						
Lead		ND	mg/L	0.00008						
Molybdenum		0.0002	mg/L	0.00006						
Selenium		ND	mg/L	0.0002						
Thallium		0.0006	mg/L	0.00007						
Lab ID: LCS-121998	11	Laboratory Control Sample				Run: ICPMS206-B_180601A			06/02/18 17:09	
Antimony		0.508	mg/L	0.0050	102	85	115			
Arsenic		0.515	mg/L	0.0010	103	85	115			
Barium		0.492	mg/L	0.010	98	85	115			
Beryllium		0.228	mg/L	0.0010	91	85	115			
Cadmium		0.240	mg/L	0.0010	96	85	115			
Chromium		0.477	mg/L	0.0010	95	85	115			
Cobalt		0.471	mg/L	0.0010	94	85	115			
Lead		0.492	mg/L	0.0010	98	85	115			
Molybdenum		0.446	mg/L	0.0050	89	85	115			
Selenium		0.488	mg/L	0.0050	98	85	115			
Thallium		0.572	mg/L	0.0010	114	85	115			
Lab ID: B18052675-004BMS3	11	Sample Matrix Spike				Run: ICPMS206-B_180601A			06/02/18 17:13	
Antimony		0.535	mg/L	0.0010	107	70	130			
Arsenic		0.538	mg/L	0.0010	108	70	130			
Barium		0.534	mg/L	0.050	105	70	130			
Beryllium		0.244	mg/L	0.0010	98	70	130			
Cadmium		0.255	mg/L	0.0010	102	70	130			
Chromium		0.501	mg/L	0.0050	100	70	130			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.8**									Batch: 121998	
Lab ID: **B18052675-004BMS3**	11	Sample Matrix Spike				Run: ICPMS206-B_180601A			06/02/18 17:13	
Cobalt		0.503	mg/L	0.0050	101	70	130			
Lead		0.521	mg/L	0.0010	104	70	130			
Molybdenum		0.489	mg/L	0.0010	98	70	130			
Selenium		0.505	mg/L	0.0010	101	70	130			
Thallium		0.615	mg/L	0.00050	123	70	130			
Lab ID: **B18052675-004BMSD**	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180601A			06/02/18 17:18	
Antimony		0.515	mg/L	0.0010	103	70	130	3.8	20	
Arsenic		0.506	mg/L	0.0010	101	70	130	6.2	20	
Barium		0.508	mg/L	0.050	99	70	130	5.0	20	
Beryllium		0.234	mg/L	0.0010	94	70	130	4.4	20	
Cadmium		0.245	mg/L	0.0010	98	70	130	4.0	20	
Chromium		0.468	mg/L	0.0050	93	70	130	6.8	20	
Cobalt		0.483	mg/L	0.0050	96	70	130	4.1	20	
Lead		0.497	mg/L	0.0010	99	70	130	4.7	20	
Molybdenum		0.472	mg/L	0.0010	94	70	130	3.6	20	
Selenium		0.482	mg/L	0.0010	96	70	130	4.7	20	
Thallium		0.579	mg/L	0.00050	116	70	130	6.0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Analytical Run: ICPMS206-B_180606A
Lab ID: QCS	11	Initial Calibration Verification Standard								06/07/18 14:34
Antimony		0.0504	mg/L	0.050	101	90	110			
Arsenic		0.0497	mg/L	0.0050	99	90	110			
Barium		0.0493	mg/L	0.10	99	90	110			
Beryllium		0.0249	mg/L	0.0010	100	90	110			
Cadmium		0.0249	mg/L	0.0010	100	90	110			
Chromium		0.0497	mg/L	0.010	99	90	110			
Cobalt		0.0513	mg/L	0.010	103	90	110			
Lead		0.0496	mg/L	0.010	99	90	110			
Molybdenum		0.0477	mg/L	0.0050	95	90	110			
Selenium		0.0519	mg/L	0.0050	104	90	110			
Thallium		0.0495	mg/L	0.10	99	90	110			
Method: E200.8										Batch: 121995
Lab ID: MB-121995	11	Method Blank				Run: ICPMS206-B_180606A				06/07/18 19:26
Antimony		ND	mg/L	0.0004						
Arsenic		ND	mg/L	0.0001						
Barium		ND	mg/L	0.00009						
Beryllium		ND	mg/L	0.0001						
Cadmium		ND	mg/L	0.00003						
Chromium		ND	mg/L	0.0002						
Cobalt		ND	mg/L	0.00004						
Lead		ND	mg/L	0.00008						
Molybdenum		ND	mg/L	0.00006						
Selenium		ND	mg/L	0.0002						
Thallium		ND	mg/L	0.00007						
Lab ID: LCS-121995	11	Laboratory Control Sample				Run: ICPMS206-B_180606A				06/07/18 20:04
Antimony		0.560	mg/L	0.0050	112	85	115			
Arsenic		0.550	mg/L	0.0010	110	85	115			
Barium		0.554	mg/L	0.010	111	85	115			
Beryllium		0.238	mg/L	0.0010	95	85	115			
Cadmium		0.268	mg/L	0.0010	107	85	115			
Chromium		0.510	mg/L	0.0010	102	85	115			
Cobalt		0.525	mg/L	0.0010	105	85	115			
Lead		0.552	mg/L	0.0010	110	85	115			
Molybdenum		0.521	mg/L	0.0050	104	85	115			
Selenium		0.542	mg/L	0.0050	108	85	115			
Thallium		0.545	mg/L	0.0010	109	85	115			
Lab ID: C18050869-010BMS3	11	Sample Matrix Spike				Run: ICPMS206-B_180606A				06/07/18 20:50
Antimony		0.569	mg/L	0.0010	114	70	130			
Arsenic		0.555	mg/L	0.0010	111	70	130			
Barium		0.616	mg/L	0.050	112	70	130			
Beryllium		0.229	mg/L	0.0010	91	70	130			
Cadmium		0.264	mg/L	0.0010	106	70	130			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Batch: 121995	
Lab ID: C18050869-010BMS3	11	Sample Matrix Spike				Run: ICPMS206-B_180606A			06/07/18 20:50	
Chromium		0.505	mg/L	0.0050	101	70	130			
Cobalt		0.512	mg/L	0.0050	102	70	130			
Lead		0.550	mg/L	0.0010	110	70	130			
Molybdenum		0.528	mg/L	0.0010	106	70	130			
Selenium		0.544	mg/L	0.0010	109	70	130			
Thallium		0.533	mg/L	0.00050	107	70	130			
Lab ID: C18050869-010BMSD	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180606A			06/07/18 20:55	
Antimony		0.545	mg/L	0.0010	109	70	130	4.1	20	
Arsenic		0.546	mg/L	0.0010	109	70	130	1.6	20	
Barium		0.595	mg/L	0.050	108	70	130	3.5	20	
Beryllium		0.222	mg/L	0.0010	89	70	130	2.9	20	
Cadmium		0.255	mg/L	0.0010	102	70	130	3.3	20	
Chromium		0.502	mg/L	0.0050	100	70	130	0.7	20	
Cobalt		0.500	mg/L	0.0050	100	70	130	2.3	20	
Lead		0.540	mg/L	0.0010	108	70	130	1.9	20	
Molybdenum		0.511	mg/L	0.0010	102	70	130	3.4	20	
Selenium		0.524	mg/L	0.0010	105	70	130	3.8	20	
Thallium		0.539	mg/L	0.00050	108	70	130	1.2	20	
Lab ID: C18050869-018BMS3	11	Sample Matrix Spike				Run: ICPMS206-B_180606A			06/07/18 21:40	
Antimony		0.568	mg/L	0.0010	114	70	130			
Arsenic		0.565	mg/L	0.0010	113	70	130			
Barium		0.581	mg/L	0.050	112	70	130			
Beryllium		0.229	mg/L	0.0010	91	70	130			
Cadmium		0.263	mg/L	0.0010	105	70	130			
Chromium		0.523	mg/L	0.0050	105	70	130			
Cobalt		0.540	mg/L	0.0050	105	70	130			
Lead		0.555	mg/L	0.0010	111	70	130			
Molybdenum		0.543	mg/L	0.0010	105	70	130			
Selenium		0.546	mg/L	0.0010	109	70	130			
Thallium		0.548	mg/L	0.00050	110	70	130			
Lab ID: C18050869-018BMSD	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180606A			06/07/18 21:45	
Antimony		0.565	mg/L	0.0010	113	70	130	0.5	20	
Arsenic		0.542	mg/L	0.0010	108	70	130	4.1	20	
Barium		0.582	mg/L	0.050	112	70	130	0.2	20	
Beryllium		0.227	mg/L	0.0010	91	70	130	0.8	20	
Cadmium		0.264	mg/L	0.0010	106	70	130	0.7	20	
Chromium		0.515	mg/L	0.0050	103	70	130	1.5	20	
Cobalt		0.536	mg/L	0.0050	105	70	130	0.7	20	
Lead		0.562	mg/L	0.0010	112	70	130	1.2	20	
Molybdenum		0.548	mg/L	0.0010	106	70	130	0.8	20	
Selenium		0.476	mg/L	0.0010	95	70	130	14	20	
Thallium		0.554	mg/L	0.00050	111	70	130	1.1	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.8**										Batch: 121995
Lab ID: **C18050869-018BMSD**	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180606A				06/07/18 21:45

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS206-B_180608A	
Lab ID: QCS	2	Initial Calibration Verification Standard							06/09/18 11:02	
Selenium		0.0508	mg/L	0.0050	102	90	110			
Thallium		0.0499	mg/L	0.10	100	90	110			
Method: E200.8									Batch: 121995	
Lab ID: MB-121995	11	Method Blank				Run: ICPMS206-B_180608A			06/09/18 11:34	
Antimony		ND	mg/L	0.0004						
Arsenic		ND	mg/L	0.0001						
Barium		ND	mg/L	0.00009						
Beryllium		ND	mg/L	0.0001						
Cadmium		ND	mg/L	0.00003						
Chromium		ND	mg/L	0.0002						
Cobalt		ND	mg/L	0.00004						
Lead		ND	mg/L	0.00008						
Molybdenum		ND	mg/L	0.00006						
Selenium		ND	mg/L	0.0002						
Thallium		ND	mg/L	0.00007						
Lab ID: LCS-121995	11	Laboratory Control Sample				Run: ICPMS206-B_180608A			06/09/18 13:01	
Antimony		0.529	mg/L	0.0050	106	85	115			
Arsenic		0.518	mg/L	0.0010	104	85	115			
Barium		0.520	mg/L	0.010	104	85	115			
Beryllium		0.231	mg/L	0.0010	93	85	115			
Cadmium		0.251	mg/L	0.0010	100	85	115			
Chromium		0.491	mg/L	0.0010	98	85	115			
Cobalt		0.492	mg/L	0.0010	99	85	115			
Lead		0.524	mg/L	0.0010	105	85	115			
Molybdenum		0.493	mg/L	0.0050	99	85	115			
Selenium		0.489	mg/L	0.0050	98	85	115			
Thallium		0.526	mg/L	0.0010	105	85	115			
Lab ID: C18050869-010BMS3	11	Sample Matrix Spike				Run: ICPMS206-B_180608A			06/09/18 13:05	
Antimony		0.533	mg/L	0.0010	107	70	130			
Arsenic		0.524	mg/L	0.0010	105	70	130			
Barium		0.580	mg/L	0.050	105	70	130			
Beryllium		0.229	mg/L	0.0010	92	70	130			
Cadmium		0.246	mg/L	0.0010	98	70	130			
Chromium		0.487	mg/L	0.0050	97	70	130			
Cobalt		0.490	mg/L	0.0050	98	70	130			
Lead		0.531	mg/L	0.0010	106	70	130			
Molybdenum		0.505	mg/L	0.0010	101	70	130			
Selenium		0.487	mg/L	0.0010	97	70	130			
Thallium		0.519	mg/L	0.00050	104	70	130			
Lab ID: C18050869-010BMSD	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180608A			06/09/18 13:10	
Antimony		0.528	mg/L	0.0010	106	70	130	1.0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp **Report Date:** 06/19/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Batch: 121995	
Lab ID: C18050869-010BMSD	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180608A			06/09/18 13:10	
Arsenic		0.521	mg/L	0.0010	104	70	130	0.6	20	
Barium		0.577	mg/L	0.050	105	70	130	0.4	20	
Beryllium		0.231	mg/L	0.0010	92	70	130	0.7	20	
Cadmium		0.245	mg/L	0.0010	98	70	130	0.0	20	
Chromium		0.481	mg/L	0.0050	96	70	130	1.2	20	
Cobalt		0.486	mg/L	0.0050	97	70	130	0.9	20	
Lead		0.525	mg/L	0.0010	105	70	130	1.0	20	
Molybdenum		0.500	mg/L	0.0010	100	70	130	1.0	20	
Selenium		0.485	mg/L	0.0010	97	70	130	0.6	20	
Thallium		0.513	mg/L	0.00050	103	70	130	1.3	20	
Lab ID: C18050869-018BMS3	11	Sample Matrix Spike				Run: ICPMS206-B_180608A			06/09/18 13:41	
Antimony		0.527	mg/L	0.0010	105	70	130			
Arsenic		0.529	mg/L	0.0010	106	70	130			
Barium		0.538	mg/L	0.050	103	70	130			
Beryllium		0.232	mg/L	0.0010	93	70	130			
Cadmium		0.245	mg/L	0.0010	98	70	130			
Chromium		0.497	mg/L	0.0050	99	70	130			
Cobalt		0.507	mg/L	0.0050	99	70	130			
Lead		0.524	mg/L	0.0010	105	70	130			
Molybdenum		0.516	mg/L	0.0010	100	70	130			
Selenium		0.494	mg/L	0.0010	99	70	130			
Thallium		0.515	mg/L	0.00050	103	70	130			
Lab ID: C18050869-018BMSD	11	Sample Matrix Spike Duplicate				Run: ICPMS206-B_180608A			06/09/18 13:46	
Antimony		0.526	mg/L	0.0010	105	70	130	0.2	20	
Arsenic		0.518	mg/L	0.0010	103	70	130	2.1	20	
Barium		0.534	mg/L	0.050	103	70	130	0.7	20	
Beryllium		0.229	mg/L	0.0010	92	70	130	1.3	20	
Cadmium		0.244	mg/L	0.0010	98	70	130	0.3	20	
Chromium		0.489	mg/L	0.0050	98	70	130	1.6	20	
Cobalt		0.508	mg/L	0.0050	99	70	130	0.0	20	
Lead		0.515	mg/L	0.0010	103	70	130	1.7	20	
Molybdenum		0.512	mg/L	0.0010	99	70	130	0.9	20	
Selenium		0.494	mg/L	0.0010	99	70	130	0.1	20	
Thallium		0.507	mg/L	0.00050	101	70	130	1.5	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: PacifiCorp
Report Date: 06/19/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E245.1**									Analytical Run: HGCV202-B_180611A	
Lab ID: **ICV**	Initial Calibration Verification Standard								06/11/18 13:57	
Mercury		0.00210	mg/L	0.00010	105	90	110			
Method: **E245.1**									Batch: 122257	
Lab ID: **MB-122257**	Method Blank					Run: HGCV202-B_180611A			06/11/18 14:54	
Mercury		ND	mg/L	0.00005						
Lab ID: **LCS-122257**	Laboratory Control Sample					Run: HGCV202-B_180611A			06/11/18 14:56	
Mercury		0.00220	mg/L	0.00010	110	85	115			
Lab ID: **C18050869-001BMS**	Sample Matrix Spike					Run: HGCV202-B_180611A			06/11/18 15:22	
Mercury		0.00219	mg/L	0.00010	110	70	130			
Lab ID: **C18050869-001BMSD**	Sample Matrix Spike Duplicate					Run: HGCV202-B_180611A			06/11/18 15:24	
Mercury		0.00223	mg/L	0.00010	111	70	130	1.7	30	
Lab ID: **C18050869-013BMS**	Sample Matrix Spike					Run: HGCV202-B_180611A			06/11/18 15:52	
Mercury		0.00220	mg/L	0.00010	110	70	130			
Lab ID: **C18050869-013BMSD**	Sample Matrix Spike Duplicate					Run: HGCV202-B_180611A			06/11/18 15:54	
Mercury		0.00220	mg/L	0.00010	110	70	130	0.2	30	
Method: **E245.1**									Analytical Run: HGCV202-B_180614A	
Lab ID: **ICV**	Initial Calibration Verification Standard								06/14/18 09:19	
Mercury		0.00196	mg/L	0.00010	98	90	110			
Method: **E245.1**									Batch: 122356	
Lab ID: **MB-122356**	Method Blank					Run: HGCV202-B_180614A			06/14/18 10:16	
Mercury		ND	mg/L	0.00005						
Lab ID: **LCS-122356**	Laboratory Control Sample					Run: HGCV202-B_180614A			06/14/18 10:18	
Mercury		0.00198	mg/L	0.00010	99	85	115			
Lab ID: **B18052749-001CMS**	Sample Matrix Spike					Run: HGCV202-B_180614A			06/14/18 10:49	
Mercury		0.00196	mg/L	0.00010	98	70	130			
Lab ID: **B18052749-001CMSD**	Sample Matrix Spike Duplicate					Run: HGCV202-B_180614A			06/14/18 10:50	
Mercury		0.00195	mg/L	0.00010	98	70	130	0.6	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp
Report Date: 06/14/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0										Batch: RA226-8956
Lab ID: LCS-RA226-8956		Laboratory Control Sample				Run: G5000W_180531C				06/12/18 12:02
Radium 226		8.8	pCi/L		86	80	120			
Lab ID: MB-RA226-8956	3	Method Blank				Run: G5000W_180531C				06/12/18 12:02
Radium 226		0.1	pCi/L							U
Radium 226 precision (±)		0.1	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C18050869-017DMS		Sample Matrix Spike				Run: G5000W_180531C				06/12/18 12:02
Radium 226		24	pCi/L		95	70	130			
Lab ID: C18050869-017DMSD		Sample Matrix Spike Duplicate				Run: G5000W_180531C				06/12/18 12:02
Radium 226		25	pCi/L		99	70	130	5.2	20	
Method: E903.0										Batch: RA226-8955
Lab ID: LCS-RA226-8955		Laboratory Control Sample				Run: G542M_180531B				06/12/18 10:13
Radium 226		7.7	pCi/L		73	80	120			S
- LCS response is outside of range for this analysis. The MB, MS, and MSD are acceptable.										
Lab ID: MB-RA226-8955	3	Method Blank				Run: G542M_180531B				06/12/18 10:13
Radium 226		0.4	pCi/L							
Radium 226 precision (±)		0.1	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C18050869-002DMS		Sample Matrix Spike				Run: G542M_180531B				06/12/18 10:13
Radium 226		22	pCi/L		85	70	130			
Lab ID: C18050869-002DMSD		Sample Matrix Spike Duplicate				Run: G542M_180531B				06/12/18 10:13
Radium 226		22	pCi/L		83	70	130	1.2	20	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp
Report Date: 06/14/18
Project: PERCM50
Work Order: C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05										Batch: RA228-5792
Lab ID: LCS-228-RA226-8955		Laboratory Control Sample				Run: TENNELEC-3_180531B				06/07/18 09:16
Radium 228		9.4	pCi/L		101	80	120			
Lab ID: MB-RA226-8955	3	Method Blank				Run: TENNELEC-3_180531B				06/07/18 09:16
Radium 228		0.10	pCi/L							U
Radium 228 precision (±)		1.0	pCi/L							
Radium 228 MDC		2	pCi/L							
Lab ID: C18050869-005DMS		Sample Matrix Spike				Run: TENNELEC-3_180531B				06/07/18 09:16
Radium 228		21	pCi/L		78	70	130			
Lab ID: C18050869-005DMSD		Sample Matrix Spike Duplicate				Run: TENNELEC-3_180531B				06/07/18 09:16
Radium 228		21	pCi/L		78	70	130	0.5	20	
Method: RA-05										Batch: RA228-5793
Lab ID: LCS-228-RA226-8956		Laboratory Control Sample				Run: TENNELEC-3_180531C				06/07/18 13:37
Radium 228		8.6	pCi/L		93	80	120			
Lab ID: MB-RA226-8956	3	Method Blank				Run: TENNELEC-3_180531C				06/07/18 13:37
Radium 228		0.03	pCi/L							U
Radium 228 precision (±)		0.9	pCi/L							
Radium 228 MDC		1	pCi/L							
Lab ID: C18050836-001CMS		Sample Matrix Spike				Run: TENNELEC-3_180531C				06/07/18 13:37
Radium 228		18	pCi/L		73	70	130			
Lab ID: C18050836-001CMSD		Sample Matrix Spike Duplicate				Run: TENNELEC-3_180531C				06/07/18 13:37
Radium 228		21	pCi/L		84	70	130	13	20	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp **Report Date:** 05/31/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2320 B									Analytical Run: MANTECH_180525A	
Lab ID: ICV	Initial Calibration Verification Standard								05/25/18 16:00	
pH		6.86	s.u.	0.010	100	98	102			
Method: A2320 B									Batch: R235736	
Lab ID: MBLK	Method Blank					Run: MANTECH_180525A			05/25/18 22:43	
Alkalinity, Total as CaCO3		1	mg/L	0.8						
Lab ID: LCS	Laboratory Control Sample					Run: MANTECH_180525A			05/25/18 22:51	
Alkalinity, Total as CaCO3		253	mg/L	5.0	100	90	110			
Lab ID: C18050868-029ADUP	Sample Duplicate					Run: MANTECH_180525A			05/25/18 23:08	
Alkalinity, Total as CaCO3		742	mg/L	5.0				0.4	10	
Lab ID: C18050869-009ADUP	Sample Duplicate					Run: MANTECH_180525A			05/26/18 00:34	
Alkalinity, Total as CaCO3		206	mg/L	5.0				0.0	10	
Lab ID: MBLK	Method Blank					Run: MANTECH_180525A			05/26/18 01:55	
Alkalinity, Total as CaCO3		1	mg/L	0.8						
Lab ID: LCS	Laboratory Control Sample					Run: MANTECH_180525A			05/26/18 02:03	
Alkalinity, Total as CaCO3		253	mg/L	5.0	101	90	110			
Lab ID: C18050869-019ADUP	Sample Duplicate					Run: MANTECH_180525A			05/26/18 02:19	
Alkalinity, Total as CaCO3		92.0	mg/L	5.0				0.3	10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp **Report Date:** 05/31/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: TDS180525B	
Lab ID: MB-25_180525A	Method Blank					Run: BAL-16_180525B			05/25/18 15:35	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	7						
Lab ID: LCS-26_180525A	Laboratory Control Sample					Run: BAL-16_180525B			05/25/18 15:35	
Solids, Total Dissolved TDS @ 180 C		1090	mg/L	11	98	90	110			
Lab ID: C18050868-028A DUP	Sample Duplicate					Run: BAL-16_180525B			05/25/18 15:37	
Solids, Total Dissolved TDS @ 180 C		12200	mg/L	100				2.0	5	
Lab ID: MB-49_180525A	Method Blank					Run: BAL-16_180525B			05/25/18 15:39	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	7						
Lab ID: LCS-50_180525A	Laboratory Control Sample					Run: BAL-16_180525B			05/25/18 15:39	
Solids, Total Dissolved TDS @ 180 C		1120	mg/L	11	101	90	110			
Lab ID: C18050869-008A DUP	Sample Duplicate					Run: BAL-16_180525B			05/25/18 15:40	
Solids, Total Dissolved TDS @ 180 C		1050	mg/L	10				0.6	5	
Lab ID: C18050869-018A DUP	Sample Duplicate					Run: BAL-16_180525B			05/25/18 15:43	
Solids, Total Dissolved TDS @ 180 C		2430	mg/L	20				0.4	5	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp **Report Date:** 05/31/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A4500-F C**										Batch: R235831
Lab ID: **LCS-10115**	Laboratory Control Sample					Run: MANTECH_180529B				05/29/18 14:20
Fluoride		2.00	mg/L	0.10	100	90	110			
Lab ID: **MBLK**	Method Blank					Run: MANTECH_180529B				05/29/18 14:25
Fluoride		ND	mg/L	0.04						
Lab ID: **C18050868-029AMS**	Sample Matrix Spike					Run: MANTECH_180529B				05/29/18 15:20
Fluoride		2.08	mg/L	0.10	82	90	110			S
Lab ID: **C18050868-030ADUP**	Sample Duplicate					Run: MANTECH_180529B				05/29/18 15:25
Fluoride		0.300	mg/L	0.10				3.3	10	
Method: **A4500-F C**										Batch: R235848
Lab ID: **LCS-9807**	Laboratory Control Sample					Run: MANTECH_180530A				05/30/18 10:50
Fluoride		2.00	mg/L	0.10	100	90	110			
Lab ID: **MBLK**	Method Blank					Run: MANTECH_180530A				05/30/18 10:55
Fluoride		ND	mg/L	0.04						
Lab ID: **C18050869-009AMS**	Sample Matrix Spike					Run: MANTECH_180530A				05/30/18 11:00
Fluoride		2.68	mg/L	0.10	102	90	110			
Lab ID: **C18050869-010ADUP**	Sample Duplicate					Run: MANTECH_180530A				05/30/18 11:06
Fluoride		0.0700	mg/L	0.10					10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp **Report Date:** 05/31/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B									Analytical Run: PHSC_101-C_180525A	
Lab ID: 6.86	2	Initial Calibration Verification Standard							05/25/18 07:27	
pH		6.86	s.u.	0.010	100	98	102			
pH Measurement Temp		19.4	°C			0	0			
Method: A4500-H B									Batch: R235703	
Lab ID: C18050869-001ADUP	2	Sample Duplicate				Run: PHSC_101-C_180525A			05/25/18 07:56	
pH		7.54	s.u.	0.010				0.1	1.5	
pH Measurement Temp		11.9	°C							
Lab ID: C18050869-011ADUP	2	Sample Duplicate				Run: PHSC_101-C_180525A			05/25/18 08:28	
pH		7.77	s.u.	0.010				0.3	1.5	
pH Measurement Temp		14.5	°C							
Lab ID: C18050869-021ADUP	2	Sample Duplicate				Run: PHSC_101-C_180525A			05/25/18 09:09	
pH		9.01	s.u.	0.010				0.2	1.5	
pH Measurement Temp		15.7	°C							

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp **Report Date:** 05/31/18

Project: PERCM50 **Work Order:** C18050869

Analyte		Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**E300.0**									Analytical Run: IC3-C_180525A	
Lab ID:	**ICV**	2	Initial Calibration Verification Standard							05/25/18 14:02	
Chloride			10.1	mg/L	1.0	101	90	110			
Sulfate			40.1	mg/L	1.0	100	90	110			
Method:	**E300.0**									Batch: R235738	
Lab ID:	**ICB**	2	Method Blank				Run: IC3-C_180525A			05/25/18 14:21	
Chloride			ND	mg/L	0.09						
Sulfate			0.3	mg/L	0.1						
Lab ID:	**LFB**	2	Laboratory Fortified Blank				Run: IC3-C_180525A			05/25/18 14:40	
Chloride			10.3	mg/L	1.0	103	90	110			
Sulfate			41.0	mg/L	1.0	102	90	110			
Lab ID:	**C18050869-002AMS**	2	Sample Matrix Spike				Run: IC3-C_180525A			05/25/18 20:25	
Chloride			35.0	mg/L	1.0	104	80	120			
Sulfate			118	mg/L	1.0	101	80	120			
Lab ID:	**C18050869-002AMSD**	2	Sample Matrix Spike Duplicate				Run: IC3-C_180525A			05/25/18 20:44	
Chloride			35.2	mg/L	1.0	105	80	120	0.6	20	
Sulfate			119	mg/L	1.0	102	80	120	0.8	20	
Lab ID:	**C18050869-012AMS**	2	Sample Matrix Spike				Run: IC3-C_180525A			05/26/18 00:54	
Chloride			86.2	mg/L	1.0	104	80	120			
Sulfate			809	mg/L	2.1	101	80	120			
Lab ID:	**C18050869-012AMSD**	2	Sample Matrix Spike Duplicate				Run: IC3-C_180525A			05/26/18 01:13	
Chloride			86.6	mg/L	1.0	105	80	120	0.5	20	
Sulfate			817	mg/L	2.1	105	80	120	1.0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: PacifiCorp **Report Date:** 05/31/18

Project: PERCM50 **Work Order:** C18050869

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2									Analytical Run: FIA201-C_180525B	
Lab ID: ICV	Initial Calibration Verification Standard								05/25/18 14:25	
Nitrogen, Nitrate+Nitrite as N		0.984	mg/L	0.010	98	90	110			
Method: E353.2									Batch: R235735	
Lab ID: MBLK	Method Blank					Run: FIA201-C_180525B			05/25/18 14:26	
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.006						
Lab ID: LFB	Laboratory Fortified Blank					Run: FIA201-C_180525B			05/25/18 14:27	
Nitrogen, Nitrate+Nitrite as N		1.08	mg/L	0.010	109	90	110			
Lab ID: C18050868-030CMS	Sample Matrix Spike					Run: FIA201-C_180525B			05/25/18 15:37	
Nitrogen, Nitrate+Nitrite as N		0.815	mg/L	0.010	82	90	110			S
Lab ID: C18050868-030CMSD	Sample Matrix Spike Duplicate					Run: FIA201-C_180525B			05/25/18 15:38	
Nitrogen, Nitrate+Nitrite as N		0.851	mg/L	0.010	85	90	110	4.4	10	S
Lab ID: C18050869-010CMS	Sample Matrix Spike					Run: FIA201-C_180525B			05/25/18 15:53	
Nitrogen, Nitrate+Nitrite as N		1.07	mg/L	0.010	107	90	110			
Lab ID: C18050869-010CMSD	Sample Matrix Spike Duplicate					Run: FIA201-C_180525B			05/25/18 15:55	
Nitrogen, Nitrate+Nitrite as N		1.06	mg/L	0.010	106	90	110	0.9	10	
Lab ID: C18050869-020CMS	Sample Matrix Spike					Run: FIA201-C_180525B			05/25/18 16:10	
Nitrogen, Nitrate+Nitrite as N		1.44	mg/L	0.010	110	90	110			
Lab ID: C18050869-020CMSD	Sample Matrix Spike Duplicate					Run: FIA201-C_180525B			05/25/18 16:11	
Nitrogen, Nitrate+Nitrite as N		1.45	mg/L	0.010	111	90	110	0.7	10	S

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

Work Order Receipt Checklist

PacifiCorp

C18050869

Login completed by: Dorian Quis
Date Received: 5/24/2018
Reviewed by: Kasey Vidick
Received by: kak
Reviewed Date: 5/29/2018
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	5.1°C On Ice		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

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.

Contact and Corrective Action Comments:

None

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Account Information *(Billing information)*

Company/Name	PacifiCorp-UT
Contact	Jeff Tucker
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Invoice	☐Hard Copy ☒Email
Receive Report	☐Hard Copy ☒Email
Purchase Order	
Quote	C4503 - Pacific Corp
Bottle Order	

Report Information *(if different than Account Information)*

Company/Name	WET
Contact	Dave Erickson
Phone	(406) 782-5220
Mailing Address	
City, State, Zip	
Email	derickson@waterenvtech.com
Receive Report	☐Hard Copy ☒Email

Special Report/Formats:
☐ LEVEL IV ☐ NELAC ☒ EDD/EDT *(contact laboratory)* ☐ Other_____

Comments

Please CC Marcus Holland with results (EDD csv and PDF)

#0392

TEMPS
14.0
5.4
13.6
14.5
10.6
6.4
11.7
5.1
12.6
13.7

Project Information

Project Name, PWSID, Permit, etc.	PERCM50
Sampler Name	L Watson
Sampler Phone	406 431 2447
Sample Origin State	Wyoming
EPA/State Compliance	☒ Yes ☐ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/ Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Total Metals	Total Mercury	Alkalinity	TDS, pH, E300.0 Anions	Nitrogen, Nitrate+Nitrite	Radium 226 + Radium 228	fluoride			See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	DJ-38	5/23	1715	4	W	✓	✓	✓	✓	✓	✓	✓					C18050869
2	DJ-3		1745	4	W	✓	✓	✓	✓	✓	✓	✓					
3	DUP-2		1800	4	W	✓	✓	✓	✓	✓	✓	✓					
4	DJ-2		1830	4	W	✓	✓	✓	✓	✓	✓	✓					
5	FB-2		1830	4	W	✓	✓	✓	✓	✓	✓	✓					
6	DJ-33		1915	4	W	✓	✓	✓	✓	✓	✓	✓					
7	DJ-34	↓	1930	4	W	✓	✓	✓	✓	✓	✓	✓					
8	HS-2	5/24	0915	4	W	✓	✓	✓	✓	✓	✓	✓					
9	HS-3	↓	0945	4	W	✓	✓	✓	✓	✓	✓	✓					
10				4	W	✓	✓	✓	✓	✓	✓	✓					

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Laura Watson	5/24/18				
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature
					5/24/18 11:23	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp °C	Temp Blank	On Ice	Payment Type	Amount $	Receipt Number *(cash/check only)*
HAND	ELI	Y N C B	Y N		Y N	Y N	CC Cash Check_____		

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

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Account Information *(Billing information)*

Company/Name	PacifiCorp-UT
Contact	Jeff Tucker
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Invoice	☐Hard Copy ▣Email
Receive Report	☐Hard Copy ▣Email
Purchase Order	
Quote	C4503 - Pacific Corp
Bottle Order	

Report Information *(if different than Account Information)*

Company/Name	WET
Contact	Dave Erickson
Phone	(406) 782-5220
Mailing Address	
City, State, Zip	
Email	derickson@waterenvtech.com
Receive Report	☐Hard Copy ▣Email
Special Report/Formats:	☐ LEVEL IV ☐ NELAC ▣ EDD/EDT *(contact laboratory)* ☐ Other_____

Comments

Please CC Marcus Holland with results (EDD csv and PDF)

Project Information

Project Name, PWSID, Permit, etc.	~~PERCM40~~ PERCM50
Sampler Name	
Sampler Phone	
Sample Origin State	Wyoming
EPA/State Compliance	▣ Yes ☐ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification *(Name, Location, Interval, etc.)*	Collection Date	Collection Time	Number of Containers	Matrix *(See Codes Above)*	Total Metals	Total Mercury	Alkalinity	TDS, pH, E300.0 Anions	Nitrogen, Nitrate+Nitrite	Radium 226 + Radium 228	fluoride			See Attached	RUSH TAT	ELI LAB ID *Laboratory Use Only*
1	DJ-47	5/23/18	1720	4	W	✓	✓	✓	✓	✓	✓	✓					C18050869
2	DJ-46	5/23/18	1755	4	W	✓	✓	✓	✓	✓	✓	✓					
3	DJ-45	5/23/18	1825	4	W	✓	✓	✓	✓	✓	✓	✓					
4	DJ-44	5/23/18	1840	4	W	✓	✓	✓	✓	✓	✓	✓					
5	DJ-12R	5/23/18	1925	4	W	✓	✓	✓	✓	✓	✓	✓					
6	DJ-43	5/23/18	1900	4	W	✓	✓	✓	✓	✓	✓	✓					
7	DUP-1	5/23/18	1725	4	W	✓	✓	✓	✓	✓	✓	✓					
8	FB-1	5/23/18	1730	4	W	✓	✓	✓	✓	✓	✓	✓					
9	DJ-37	5/24/18	0820	4	W	✓	✓	✓	✓	✓	✓	✓					
10	DJ-36	5/24/18	0910	4	W	✓	✓	✓	✓	✓	✓	✓					

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Relinquished by (print)	Date/Time	Signature	**Received by Laboratory (print)**	Date/Time 5/24/18 11:23	**Signature**

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp °C	Temp Blank	On Ice	Payment Type	Amount	Receipt Number *(cash/check only)*
HAND	ELI	Y (N) C B	(Y) N		(Y) N	(Y) N	CC Cash Check_____	$	

DJ-40 @ 0940
DJ-35 @ 1010

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

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Account Information *(Billing information)*

Company/Name	
Contact	
Phone	See Pg 1
Mailing Address	
City, State, Zip	
Email	
Receive Invoice ☐Hard Copy ☐Email	Receive Report ☐Hard Copy ☐Email
Purchase Order / Quote / Bottle Order	

Report Information *(if different than Account Information)*

Company/Name
Contact
Phone
Mailing Address
City, State, Zip
Email
Receive Report ☐Hard Copy ☐Email
Special Report/Formats: ☐ LEVEL IV ☐ NELAC ☐ EDD/EDT *(contact laboratory)* ☐ Other_____

Comments

Project Information

Project Name, PWSID, Permit, etc.	PERCM50
Sampler Name	Sampler Phone
Sample Origin State	EPA/State Compliance ☐ Yes ☐ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification *(Name, Location, Interval, etc.)*	Collection Date	Collection Time	Number of Containers	Matrix *(See Codes Above)*	Analysis Requested: See pg 1	See Attached	RUSH TAT	ELI LAB ID *Laboratory Use Only*
1	DJ-40	5/24/18	0940	4	W	X X X X X X X			C18050869
2	DJ-35	5/24/18	1010	4	W	X X X X X X X			
3									
4									
5									
6									
7									
8									
9									
10									

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	~~Mandy~~					
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time 5/25/18 11:23	Signature

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp °C	Temp Blank	On Ice	Payment Type	Amount $	Receipt Number *(cash/check only)*
HAND	ELI	Y (N) C B	(Y) N		(Y) N	(Y) N	CC Cash Check_____		

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ELI-COC-12/16 v.1

Constituents Analyzed	
Appendix III	Appendix IV
Boron	Antimony
Calcium	Arsenic
Chloride	Barium
Fluoride	Beryllium
pH	Cadmium
Sulfate	Chromium
Total Dissolved Solids (TDS)	Cobalt
	Fluoride
	Lead
	Lithium
	Mercury
	Molybdenum
	Selenium
	Thallium
	Radium 226 and 228 Combined

Fluoride is included in both Appendix III and Appendix IV analyte lists. All wells have undergone analysis for both analyte lists for each event. Fluoride was not analyzed twice. The results are reported once under Appendix III constituents for each sample / each event.