October 2021
Plant Gadsden

Groundwater Remedy Selection Report

Prepared for Alabama Power Company

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Prepared for
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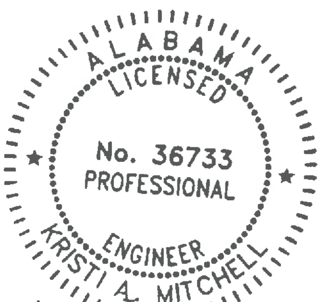
Engineer's Certification

This *Groundwater Remedy Selection Report* has been prepared in accordance with the U.S. Environmental Protection Agency's coal combustion residuals rule (40 Code of Federal Regulations Part 257, Subpart D) and the Alabama Department of Environmental Management Administrative Code Ch. 335-13-15. This report was prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer is affixed below. The undersigned is practicing through Anchor QEA, LLC, which is an authorized engineering business in the State of Alabama (Certificate of Authorization license number 5073; a copy of this license is provided in Appendix A).



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ABBREVIATIONS

ACM	*Assessment of Corrective Measures*
ADEM	Alabama Department of Environmental Management
Admin. Code	Administrative Code
APC	Alabama Power Company
ASM	adaptive site management
CAS	corrective action system
CCR	coal combustion residuals
CFR	Code of Federal Regulations
cm/sec	centimeter per second
COI	constituent of interest
EPRI	Electric Power Research Institute
Facility Plan	*Facility Plan for Groundwater Investigation*
GWPS	groundwater protection standard
ISS	in situ solidification/stabilization
MNA	monitored natural attenuation
NPDES	National Pollutant Discharge Elimination System
Plant Gadsden	Gadsden Electric Generating Plant
PRB	permeable reactive barrier
RCRA	Resource Conservation and Recovery Act
Site	Plant Gadsden Ash Pond
SSE	selective sequential extraction
SSL	statistically significant level
UIC	Underground Injection Control
USEPA	U.S. Environmental Protection Agency

Executive Summary

Since submittal of the *Assessment of Corrective Measures* (ACM) in July 2020 (Anchor QEA 2020a), extensive investigations have been performed to select effective corrective measures for arsenic and lithium (constituents of interest [COIs]) in groundwater at the Plant Gadsden Ash Pond (Site). The following corrective measures were selected:

- Source control to include dewatering, consolidation, and capping of the Site
- Geochemical manipulation via injections in the two areas with COIs to remove them from groundwater and immobilize them in situ
- Monitored natural attenuation (MNA) over the entire Site

Closure of the Site, which included dewatering, consolidation, and capping, has reduced source contributions to groundwater. Geochemical manipulation via injections was selected because of its effectiveness, ease of implementation, versatility (ability to treat more than one COI with the same treatment solution), ability to implement in areas with limited working space, and lack of byproducts that would require further treatment or disposal. MNA was selected because substantial evidence indicates that it is currently occurring at the Site.

Effective injection treatment has been performed for arsenic in groundwater under variable geochemical conditions using iron-based treatment solutions (Anchor QEA 2017, 2018, 2019a, 2019b). In laboratory treatability studies conducted for the Electric Power Research Institute and large utility companies, mixed oxides of iron, manganese, and magnesium in solution were proven effective for arsenic, lithium, and other constituents (EPRI 2021). Site-specific laboratory treatability studies using Site aquifer media and impacted groundwater will be performed prior to field implementation of injection treatment. These studies will evaluate multiple viable treatment solutions and a range of doses. After selection of the optimum treatment reagents and doses, the two areas with statistically significant levels of arsenic and lithium concentrations in groundwater will be treated with a line of injection points.

Extensive site-specific geochemical studies performed in 2020 and 2021 demonstrate that MNA is a viable corrective action for COIs in groundwater at the Site (Anchor QEA 2020b, 2021). The preponderance of evidence indicates that Site conditions meet the U.S. Environmental Protection Agency's evaluation criteria for the use of MNA, specifically: area of impacts stable or shrinking, identified mechanisms for attenuation, stability of the attenuating mechanisms, sufficient aquifer capacity for attenuation, and time to achieve groundwater protection standards (GWPSs) considered reasonable when compared to other corrective action alternatives. The ACM identified other corrective measures that could be used in conjunction with MNA.

Investigations performed to support MNA included preparation of concentration versus time and concentration versus distance graphs for COIs in groundwater; groundwater, well solids (precipitates), and soil sampling; laboratory analysis of well solids and soil samples for bulk chemistry (X-ray fluorescence), mineralogy (X-ray diffraction), and cation exchange capacity; geochemical modeling; selective sequential extraction (SSE) to determine associations of COIs with attenuating solids; and column studies to assess aquifer capacity for attenuation.

All concentration versus time graphs indicate that arsenic and lithium concentrations are stable or decreasing with time in the two areas with COIs. Decreasing trends were extrapolated to estimate time to achieve GWPSs. Also, concentration versus distance graphs along downgradient transects indicate that arsenic and lithium are decreasing with distance from the areas with COIs.

Based on the geochemical investigations, multiple lines of evidence support multiple attenuating mechanisms, depending upon the COIs. The major attenuating mechanisms include sorption on and/or coprecipitation with iron and manganese oxides (for arsenic and lithium), ion exchange on clays (for lithium), and precipitation of barium arsenate (for arsenic). Both COIs are subject to physical attenuation mechanisms such as dispersion and flushing, which will contribute to decreased concentrations with time and distance from the areas with COIs.

Column studies were performed to assess the ability for the aquifer media (soil) to take up COIs. Arsenic and lithium are attenuated by aquifer media, as arsenic in column effluent remained below 25% of the influent concentrations (i.e., greater than 75% removal). Though not as strongly attenuated as arsenic, lithium is sufficiently attenuated and remained at 60% to 80% of the influent levels (20% to 40% removal) in column effluent (for columns using shallower aquifer media). This attenuation capacity was extrapolated to the entire mass of the aquifer downgradient of the consolidated Site but within the property boundary. The extrapolation showed that the aquifer has an attenuating capacity of many more times needed based on the mass of arsenic and lithium requiring attenuation.

SSE studies indicate that most of the mass of arsenic and lithium occurs in the oxidizable and residual fractions, which are very stable attenuation phases. Therefore, remobilization back into groundwater is not expected. Some of the mass of arsenic occurs in the exchangeable fraction, which is somewhat less stable.

For lithium, estimated time to achieve GWPSs by MNA is 13 years or less. Depending on location, estimated time to achieve GWPSs for arsenic by MNA ranges from less than 10 years for GSD-AP-MW-4 to approximately 80 years for GSD-AP-MW-2. Though these time frames are reasonable to achieve GWPSs by MNA, injection treatment (enhanced attenuation) is expected to accelerate time to achieve GWPSs, particularly in the area of GSD-AP-MW-2. Source control, geochemical manipulation via injections in the two areas with COIs to remove them from groundwater and immobilize them in situ, and MNA over the entire Site are expected to achieve GWPSs in approximately 13 years, which is a reasonable time frame as compared to the other, more aggressive methods investigated as part of the remedy selection process. More aggressive methods are not expected to achieve GWPSs sooner than 13 years.

Extensive sitewide monitoring will be performed to evaluate the remedial effectiveness of individual corrective actions such as injection treatment, as well as the cumulative effects of closure (source control), injections, and MNA. The monitoring plan for injections will be developed after treatability studies, because those studies are needed to select treatment solutions and the associated monitoring parameters. Monitoring parameters may include COIs and other indicator parameters based on the composition of the treatment solutions. Monitoring frequency will be based on the hydraulics of the aquifer in the areas of interest and distance of the monitoring wells from the line of injection.

The certified compliance monitoring network will be supplemented as needed to establish a comprehensive groundwater remedy plan meeting the requirements of 40 Code of Federal Regulations (CFR) § 257.98(a) and Alabama Department of Environmental Management (ADEM) Administrative Code (Admin. Code) r. 335-13-15-.06(9)(a). The groundwater remedy monitoring plan will be submitted within 90 days and include: 1) the certified coal combustion residuals compliance monitoring that meets the assessment monitoring requirements of 40 CFR § 257.95 and ADEM Admin. Code r. 335-13-15-.06(6); 2) additional wells that document the effectiveness of the remedy; and 3) sample locations and data evaluation that demonstrate compliance with the GWPS and protection of potential human and ecological receptors.

Alabama Power Company will employ an adaptive site management approach to perform ongoing remedy system evaluation, consider adjustments to the remedy, and ensure achievement of corrective action objectives at the Site. Adaptive triggers will be developed, and additional actions (monitoring, analysis, and/or supplemental corrective measures) will be implemented as needed. Details on the sitewide remedial effectiveness monitoring program, including adaptive triggers, will be provided in a detailed monitoring plan to be submitted within 90 days of this *Groundwater Remedy Selection Report*.

1 Introduction

1.1 Purpose

This *Groundwater Remedy Selection Report* was prepared to meet the requirements of the U.S. Environmental Protection Agency (USEPA) coal combustion residuals (CCR) Rule 40 Code of Federal Regulations (CFR) § 257.97, the Alabama Department of Environmental Management (ADEM) Administrative Code (Admin. Code) r. 335-13-15-.06(8), and Part C of Administrative Order No. 19-104-GW at Alabama Power Company's (APC's) Gadsden Electric Generating Plant (Plant Gadsden) Ash Pond (Site). Specifically, this report has been prepared to present a groundwater corrective action plan to address the occurrence of arsenic and lithium in groundwater at the Site.

Prior to preparing this final *Groundwater Remedy Selection Report*, semiannual progress reports were prepared to describe the progress made in evaluating the viable remedies (Anchor QEA 2020b, 2021).

1.2 Site Location and Description

Plant Gadsden is located in the northeastern area of the city of Gadsden in central Etowah County, Alabama. The physical address of the plant is 1000 Goodyear Avenue, Gadsden, Alabama 35903. Plant Gadsden occupies Sections 2, 3, and 11, Township 12 South, Range 6 East. The Site is located northeast of the plant and is separated from the main plant by the Coosa River (Figure 1; SCS 2021).

The Site went into service in 1949 but stopped receiving CCR in 2015 when Units 1 and 2 were converted to natural gas; however, it continued to receive process water from the plant. The discharge structure continued to function as designed until early 2016, when closure activities began (APC 2020).

1.3 Site Closure

Construction activities associated with closure reached substantial completion in August 2018. Due to final grades of the closed facility requiring variances to conform to the federal CCR rule and ADEM's rules, final certification was held pending receipt of approval from ADEM for the requested variances. ADEM issued formal written approval on February 25, 2020.

Site closure included removal of free water, dewatering the CCR material, grading the Site to promote drainage, and installing a final cover consisting of a low-permeability cover system consisting of synthetic turf and geomembrane. The final cover was constructed over the consolidated footprint of the CCR unit, which has an area of approximately 55 acres. Figures 2 through 4 depict Site closure and show the consolidated CCR, surrounding geology, and uppermost aquifer.

1.4 Geology, Hydrogeology, and Surface Water Hydrology

The shallow geology at the Site consists of two distinct units, unconsolidated alluvial deposits and bedrock. The characteristics of these units are described in previous reports (SCS 2019a) and are summarized below.

Surficial soils described as Quaternary-age alluvial terrace deposits consist of varying amounts of sand, silt, clay, and gravel associated with river deposition (Raymond et al. 1988). The thickness of the alluvial deposits ranges from 20 to 30 feet at the Site. This deposit typically coarsens downward and displays a horizontal coarsening pattern toward the north-northeast. Site groundwater monitoring wells are installed within higher permeability zones near the base of the alluvial deposits and near the interface with underlying rock.

The Conasauga Formation (Middle and Upper Cambrian) consists of varying thicknesses of limestone, dolomite, and shale. Chert and siltstone horizons can be present locally. Limited core logs from the Site indicate the Conasauga Formation to be a medium to dark gray mudstone or shale with noticeable calcite veining. The Conasauga Formation is not considered a water-bearing aquifer at the Site.

Groundwater level monitoring was initiated with background sampling in December 2017 before Site closure and dewatering were complete. Groundwater elevation contours between December 2017 and December 2018 displayed a radial pattern of groundwater flow away from the Site. Groundwater flow was interpreted to flow to the north, south, east, and west from the Site. Therefore, wells and piezometers around the periphery of the pond are all classified as downgradient. Between December 2018 and February 2019 (4 to 6 months after closure), the radial groundwater flow pattern diminished and became a northeast-to-southwest groundwater flow pattern toward the Coosa River. This is likely the result of groundwater flow restoring to pre-pond conditions as the hydraulic influence of the pond was diminished by closure and dewatering (SCS 2019b).

Because groundwater flow conditions have changed at the Site, wells previously identified as being downgradient (GSD-AP-MW-1, GSD-AP-MW-2, GSD-AP-MW-3, GSD-AP-MW-4, GSD-AP-MW-5, GSD-AP-PZ-1, GSD-AP-PZ-5, and GSD-AP-PZ-6) now appear hydraulically upgradient of the Site (SCS 2021). Potentiometric surface maps from July 2018 to August 2020 are included in Appendix B.

1.5 Nature and Extent of Groundwater Exceedances

Based on groundwater monitoring performed pursuant to the federal CCR rule and ADEM's rules, arsenic and lithium have been identified in Site groundwater at concentrations exceeding the groundwater protection standard (GWPS). As shown in Figure 5, arsenic concentrations greater than the GWPS occur in the northern (upgradient) part of the Site, primarily at two locations. In contrast, the occurrence of lithium at concentrations greater than the GWPS is constrained to a single location within the area of arsenic exceedances. The lateral extent of the GWPS exceedances are delineated by a network of upgradient, side gradient, and downgradient wells. Geologic cross sections presented in Appendix C include isoconcentration lines depicting GWPS exceedances referenced to Site stratigraphy.

Background groundwater sampling at the Site occurred between December 2017 and February 2019. Compliance detection sampling began in February 2019. Statistically significant increases of Appendix III to 40 CFR Part 257 constituents were noted during compliance detection sampling events as described in the *2018 Annual & 2019 First Semi-Annual Groundwater Monitoring and Corrective Action Report* (SCS 2019a). The Appendix III statistically significant increases triggered assessment sampling for Appendix IV constituents, with the first assessment sampling event occurring in August 2019.

A *Facility Plan for Groundwater Investigation* (Facility Plan; SCS 2019b) at the Site was completed to meet the requirements of Order No. 19-104-GW issued to APC by ADEM on August 27, 2019. A Facility Plan was submitted on September 30, 2019, to satisfy Part C of the order. The Facility Plan included the following elements:

- Characterizing the nature and extent of groundwater impacts, defined as Appendix IV constituents that statistically exceed GWPSs
- Collecting data on the nature and estimated quantity of material released
- Installing at least one additional well at the facility boundary
- Establishing an Assessment Monitoring Program
- If necessary, scheduling the notification of persons who own or reside on land that overlies areas where Appendix IV constituents statistically exceed GWPSs
- Providing a schedule for implementing a comprehensive groundwater investigation

The Facility Plan summarized the proposed approach for completing the tasks necessary to satisfy Part C of the order.

Details on groundwater data evaluation and monitoring well abandonments and installations (including wells installed for delineation) are provided in annual groundwater monitoring and corrective action reports (SCS 2019a, 2020, 2021). During the most recent reporting period, the Appendix IV constituents arsenic and lithium were noted at statistically significant levels (SSLs) above the GWPS as follows:

- Arsenic at monitoring wells GSD-AP-MW-2 and GSD-AP-MW-4
- Lithium at monitoring wells GSD-AP-MW-4

Several phases of investigation have been completed at the Site to delineate the extent of Appendix IV constituents exceeding GWPSs (SCS 2019a, 2020, 2021). Horizontal and vertical delineation of arsenic and lithium GWPS exceedances was accomplished by a stepping-out approach based on groundwater flow direction relative to monitoring wells exhibiting exceedances. Delineation wells were installed in October 2019 and January 2020.

2 Remedy Selection Process and Performance Standards

Groundwater remedy selection was performed in two stages: completing an assessment of corrective measures to identify potentially feasible remedies for the Site after the initial determination that GWPSs were exceeded, followed by an evaluation of potential remedies to develop this specific remedy plan.

2.1 Assessment of Corrective Measures

In July 2020, the *Assessment of Corrective Measures* (ACM) was prepared pursuant to USEPA CCR rule (40 CFR Part 257, Subpart D), ADEM Admin. Code r. 335-13-15, and an Administrative Order issued by ADEM (AO 19-104-GW) to evaluate potential groundwater corrective measures for the occurrence of arsenic and lithium in groundwater at SSLs at the Site (Anchor QEA 2020a). This ACM was the first step in developing a long-term corrective action plan to address GWPS exceedances identified at the Site.

As described in the ACM, the following remedies were considered potential groundwater corrective measures for the Site:

- Geochemical manipulation via injection of treatment solutions
- Monitored natural attenuation (MNA)
- Hydraulic containment (pump-and-treat and possibly tree wells to help control hydraulic gradient)
- Permeable reactive barrier (PRB) walls
- Vertical barrier walls
- Permeation grouting
- In situ solidification/stabilization (ISS)

Since submittal of the ACM, desktop studies, field work, and laboratory studies have been performed to evaluate potential corrective measures for the Site. Results of these studies are summarized in the semiannual remedy selection progress reports and in this report (Anchor QEA 2020b, 2021).

2.2 Remedy Performance Standards

The ACM was only the first step in the process for developing a groundwater remedy. The CCR rule contemplated that multiple potential remedies would be identified as potentially effective at achieving the corrective action objectives outlined in 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b). Thus, following the ACM, the remedial options were evaluated to identify a remedy plan that meets the following five performance criteria in 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b). As required in the rules, a remedy must use the following:

1. Be protective of human health and the environment.
2. Attain applicable GWPSs as specified in the CCR rule.

3. Control the source(s) of the release so as to reduce or eliminate, to the extent feasible, further releases of Appendix IV to 40 CFR Part 257 constituents into the environment.
4. Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, considering factors such as avoiding inappropriate disturbances of sensitive ecosystems.[1]
5. Comply with any relevant standards (i.e., all applicable Resource Conservation and Recovery Act [RCRA] requirements) for management of wastes generated by the remedial actions.

2.3 Remedy Selection Considerations

In selecting a remedy plan to meet the above performance criteria, several factors are set forth in 40 CFR § 257.97(c) and ADEM Admin. Code r. 335-13-15-.06(8)(c) to weigh which option(s) may be appropriate based on site-specific conditions. These factors include the following:

1. The long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on consideration of the following
   i. Magnitude of reduction of existing risks
   ii. Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy
   iii. The type and degree of long-term management required, including monitoring, operation, and maintenance
   iv. Short-term risks that might be posed to the community or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminant
   v. Time until full protection is achieved
   vi. Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment
   vii. Long-term reliability of the engineering and institutional controls
   viii. Potential need for replacement of the remedy
2. The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:
   i. The extent to which containment practices will reduce further releases
   ii. The extent to which treatment technologies may be used

[1] The preamble to the CCR rule explains that this requirement is "more directly related to remediation of contamination associated with a release, such as from a collapse or structural failure of a CCR unit," not a release to groundwater (80 Federal Register 21302, 21407 [April 17, 2015]). That kind of circumstance is not present at the Site and, therefore, does not apply, but this provision is included here for completeness when referencing the rule requirements.

3. The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors
   i. Degree of difficulty associated with constructing the technology
   ii. Expected operational reliability of the technologies
   iii. Need to coordinate with and obtain necessary approvals and permits from other agencies
   iv. Availability of necessary equipment and specialists
   v. Available capacity and location of needed treatment, storage, and disposal services
4. The degree to which community concerns are addressed by a potential remedy(s)

None of these factors is given greater weight over another, nor is a formula or balancing process prescribed by the rules. After considering the various factors, the rules provide facilities with discretion in selecting the final remedy plan as long as it will achieve the remedial objectives in 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b). Therefore, more technically or mechanically complex and aggressive approaches may not always make up the most suitable remedy option for a site.

The CCR rule does not establish a set time frame for a facility to evaluate potential remedies and develop a final remedy plan. 40 CFR § 257.97(a) and ADEM Admin. Code r. 335-13-15-.06(a) require an owner or operator to select a remedy "as soon as feasible," and 80 Federal Register 21407 explains USEPA declined to set a specific time frame for selecting a remedy because sites vary in complexity.

2.4 Remedy Evaluation

As discussed in Section 2.1, the ACM identified potentially feasible remedies for groundwater corrective measures for the Site. The following provides details regarding the evaluation of each remedy relative to the considerations listed in 40 CFR § 257.97(c) and ADEM Admin. Code r. 335-13-15-.06(c).

2.4.1 Geochemical Manipulation via Injection of Treatment Solutions

Geochemical manipulation was evaluated relative to the considerations listed in 40 CFR § 257.97(c) and ADEM Admin. Code r. 335-13-15-.06(c) and is retained as part of the planned remedy for the following reasons:

- Proven effectiveness for arsenic in field applications and effectiveness for lithium in laboratory treatability studies on CCR-impacted groundwater
- Ability to treat more than one COI with the same treatment solution
- Suitable for spot (isolated area) treatment or creation of a linear treatment zone perpendicular to groundwater flow
- Compatibility with and enhancement of natural attenuation processes

- Ability to implement in areas with limited working space
- Lack of byproducts that would require further treatment or disposal

Typical steps in a geochemical manipulation treatment include the following:

- Laboratory treatability studies to determine the optimum reagents, concentration, and dose
- Design, including spacing and depth of injection points, injection rates, travel time, and radius of influence, considerations which are largely based on site hydrogeological characteristics and injection logistics
- Additional fine-scale delineation of the impacted area in the field
- Implementation of field pilot test and remedial effectiveness monitoring

Effective injection treatment has been performed for arsenic in groundwater under variable geochemical conditions using iron-based treatment solutions (Anchor QEA 2017, 2018, 2019a, 2019b). In laboratory treatability studies conducted for the Electric Power Research Institute (EPRI) and large utility companies, mixed oxides of iron, manganese, and magnesium in solution were proven effective for arsenic, lithium, and other constituents (EPRI 2021).

2.4.2 Monitored Natural Attenuation

MNA was evaluated relative to the considerations listed in 40 CFR § 257.97(c) and ADEM Admin. Code r. 335-13-15-.06(c) and is retained as part of the planned remedy. Extensive geochemical and related studies demonstrate that MNA is a viable corrective action for groundwater impacts associated with the Site. The preponderance of evidence indicates that Site conditions meet USEPA's evaluation criteria for MNA, specifically: area of impacts stable or shrinking, identified mechanisms for attenuation, stability of the attenuating mechanisms, sufficient aquifer capacity for attenuation, and time to achieve GWPSs reasonable as compared to other corrective action alternatives. The ACM identified alternative corrective measures, which is the last criteria should MNA not perform as expected. Injection treatments will be performed in the two areas with COIs in groundwater; therefore, MNA is one component of corrective action, rather than a standalone remedy. The *Monitored Natural Attenuation Demonstration* report is included as Appendix D.

2.4.3 Hydraulic Containment (Pump-and-Treat)

Hydraulic containment is not recommended for the following reasons:

- Inefficiency due to infrastructure, pumping, and subsequent water treatment focused on two relatively small discrete locations, specifically: relatively large infrastructure requirements compared to the amount of groundwater extracted and treated
- Relatively high operation and maintenance requirements
- Low sustainability (excessive use of resources)

Pumping wells, piping, and a water treatment system would be required to implement pump-and-treat at the Site. Pump-and-treat systems typically have high operation and maintenance requirements (USEPA 2002). These include keeping the wells, pumps, piping, and water treatment system in working order and replacing components as needed. Due to fouling, which is common, pumping wells often require well cleaning; rehabilitation; and, under the most adverse conditions, replacement of the wells. Pumps and components of the water treatment system will need to be replaced periodically. In addition, water treatment for the two COIs at the Site will require an ongoing supply of water treatment chemicals such as ferric chloride and sodium hydroxide (for pH adjustment) and will produce a sludge that will need to be dewatered and disposed of properly. Water treatment for lithium may require reverse osmosis. Water treatment systems usually require an operator.

Hydraulic containment (pump-and-treat) will likely not offer any time advantage to achieving GWPSs over MNA or enhanced MNA due to slow COI release from the aquifer media. In fact, MNA and geochemical manipulation (enhanced MNA) may achieve GWPSs sooner than pump-and-treat. Natural attenuation is occurring at the Site, and pump-and-treat would operate against (essentially try to reverse) the natural processes already occurring. Geochemical manipulation, on the other hand, would be designed to enhance natural attenuation. Due to the infrastructure required to achieve hydraulic containment, ongoing water treatment, and long duration required (decades), hydraulic containment (pump-and-treat) would require many resources (electricity, water treatment chemicals, etc.) without offering advantages over MNA or geochemical manipulation (enhanced MNA).

Pump-and-treat is also one of the least-sustainable groundwater corrective actions, as it requires extensive resources to implement and operate. These resources are expended for decades and include raw materials for the infrastructure, ongoing electricity use, water treatment chemicals, water treatment system operation, pump replacement, well redevelopment and maintenance, equipment maintenance, and laborers for monitoring and maintenance. Geochemical manipulation and MNA, however, are among the most sustainable groundwater corrective actions due to minimal infrastructure and relatively low operation and maintenance requirements.

Tree wells to enhance hydraulic containment were considered in the ACM. Some recent data suggest that the groundwater flow direction on the northeast side of the closed pond is changing from southwest-to-northeast (away from the closed pond) to northeast-to-southwest (back under the closed pond), making tree wells not applicable, as they would be planted northeast (upgradient) of the closed pond. Tree wells will be retained as a potential corrective action, however, in case they have a niche application.

2.4.4 PRB and Vertical Barrier Walls

PRB and vertical barrier walls are feasible corrective actions for the Site. However, they are not recommended for the following reasons:

- Geometry of the areas of impact: impacts occur in two discrete, isolated areas. Walls are more effective for linear installations perpendicular to groundwater flow across plumes.
- Some potentiometric data suggest that the flow direction may be changing from southwest-to-northeast, to northeast-to-southwest in the area of impacts due to pond closure; if so, the only available location for the walls would be upgradient of the impacts.
- Periodic replacement of the PRB media would have to be performed as the media become spent or clogged.
- Walls do not address the impacted groundwater that has previously moved beyond the consolidated footprint of the CCR.
- Walls are more difficult to implement than some other viable remedies, as they typically require trenching and emplacement of reactive media in the trench through a slurry.

The reactive media in the PRB wall may be complex due to the different chemical properties of the two COIs. Laboratory treatability studies would need to be performed to determine the optimum media composition and life of the media. The media loses effectiveness with time (sorption properties diminish as COIs are captured) and would likely become fouled and less permeable, even before reactivity was diminished. Therefore, reactive media must be replaced periodically based on laboratory studies and groundwater monitoring near the PRB wall.

2.4.5 Permeation Grouting

Permeation grouting can be performed in alluvial sands and gravels if the fines (silt and clay) content is not high enough to inhibit the mobility of the grout in the pore spaces. Based on a review of grain size analyses performed in 2019, and consistent with visual observation, many soil samples contain fines greater than approximately 20%, which would impede the flow of grout. Some sand and gravel zones may be amenable to permeation grouting, but the entire saturated thickness of the surficial aquifer in the areas of impacts is probably not. Permeation grouting is, therefore, not recommended for further evaluation.

2.4.6 In Situ Solidification/Stabilization

ISS is a viable corrective measure for the Site but is likely excessive for the relatively small area and magnitude of impacts. Injection of chemical treatment solution will likely achieve the same objective as mixing cement (and possibly chemical additives) with the soil. ISS would be more labor intensive to implement compared to the selected technologies. Also, if groundwater flow direction is changing to the southwest in the area of impacts, ISS could create a groundwater mound upgradient of the pond. ISS is, therefore, not recommended for further evaluation.

3 Selected Groundwater Remedy

Since submittal of the ACM in July 2020 (Anchor QEA 2020a), extensive investigations have been performed to select effective corrective measures for COIs in groundwater at the Site. Semiannual status reports regarding investigation and evaluation have been submitted to ADEM and posted to the Site's CCR compliance webpage.

Based on investigation and evaluation, the following combination of corrective measures are proposed to address GWPS exceedances at the Site:

- Source control (complete)
  - Dewatering and consolidating the Site footprint
  - Installing a low-permeability geosynthetic cover system over the consolidated footprint
- Geochemical manipulation
  - Injecting treatment solutions into the two areas with arsenic and lithium SSLs to remove them from groundwater and immobilize them in situ
  - Monitoring treatment performance
- MNA
  - Establish no-exceedance boundary monitoring
  - Monitor concentration reduction and natural attenuation mechanisms
- Adaptive site management (ASM; discussed in Section 5)
  - Routinely evaluate remedy system performance
  - Measure performance against interim performance standards (adaptive triggers)
  - Systematically re-evaluate remedy system performance against adaptive triggers

The selected remedy plan meets the performance standards of 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b) and will achieve the following:

- Be protective of human health and the environment.
- Attain the GWPS specified in the rules.
- Control the source of release to reduce or eliminate, to the extent feasible, further releases to the environment.
- Comply with any relevant standards (i.e., all applicable RCRA requirements) for management of wastes generated by the remedial actions.

As required by 40 CFR § 257.97(a) and ADEM Admin. Code r. 335-13-15-.06(8)(a), Sections 3.1 through 3.3 describe the selected remedy.

3.1 Source Control

The Site was closed in a manner that controls “the source(s) of release so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment,” as required by 40 CFR § 257.97(b)(3) and ADEM Admin. Code r. 335-13-15-.06(8)(b)(3).

Construction activities associated with Site closure were substantially completed in August 2018. The proposed corrective action strategy incorporates the closure of the Site, which controls the source of CCR constituents to groundwater by removing free liquid from the CCR, consolidating the CCR, encircling the Site with a perimeter dike and drainage ditch, re-grading the Site, and capping the CCR in place to prevent stormwater infiltration.

3.1.1 Dewatering and Consolidation

Free water was removed through pumping, while maintaining compliance with the National Pollutant Discharge Elimination System (NPDES) discharge limits. The wet CCR was dewatered to the extent necessary to allow a stable working surface for earthwork equipment. Interstitial water was removed through one or a combination of trenching, ditching, or well point removal. All water was sent to an on-site water treatment system prior to discharge to ensure compliance with the NPDES discharge limits. Dewatering the existing CCR reduces the potential for COI releases to groundwater as the quantity of vertical flow is drastically reduced.

CCR was removed from certain areas and consolidated to reduce the size of the closure footprint. CCR was removed from the southwestern portion of the impoundment and was used to construct grades to provide draining on top of the consolidated footprint. Areas where CCR was removed were excavated to remove all visible CCR and were over excavated into the subgrade soils. The consolidated footprint area is approximately 55 acres.

3.1.2 Final Grades

The existing CCR was left in place or moved, compacted, and graded to final grades. In general, the surface of the CCR pond slopes at 3% to 5% from the crest in the center to a perimeter ditch around the exterior of the pond area. Side slopes range from 3H:1V to 4H:1V. The perimeter ditch conveys stormwater runoff to discharge points around the closed pond, which ensures positive drainage over the entire closed pond surface and prevents the pooling of water on the cover.

3.1.3 Final Cover System (Cap)

The final cover was constructed to “control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration” of stormwater into the closed CCR unit, which mitigates potential releases of COIs to groundwater. The cover consists of the following (described from the final CCR surface upward):

- 6 inches of protective soil
- 50-mil low-density polyethylene geosynthetic liner
- Engineered synthetic turf product and sand infill material with a combined permeability of 10^{-7} cm/sec or less

As required by 40 CFR § 257.102(d) and ADEM Admin. Code r. 335-13-15-.07(3)(d), infiltration is also being prevented by providing sufficient grades and slopes to:

- Preclude the probability of future impoundment of water or sediment on the cover system
- Ensure slope and cover system stability
- Minimize the need for further maintenance
- Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices

3.2 Geochemical Manipulation via Injection of Treatment Solutions

Geochemical manipulation via subsurface injections is an in situ remediation technology for inorganic constituents in groundwater. In this technology, treatment solutions are injected to create solid precipitates, which remove COIs from groundwater during their formation and continue to sorb COIs on their surfaces over time. Geochemical manipulation for arsenic is well established under a range of groundwater geochemical conditions. Geochemical manipulation is an emerging technology for lithium and has had significant technological development over the last 3 years (EPRI 2021).

Geochemical manipulation via injections will be implemented in the areas with COIs in groundwater, specifically in the vicinity of GSD-AP-MW-2 and GSD-AP-MW-4 (Figure 6). To perform the injection treatment, the following steps will be completed:

- Collect soil (aquifer media) and groundwater samples for bench-scale treatability studies.
- Complete bench-scale studies and identify optimum treatment solutions and doses.
- Plan and install the injection and monitoring points at the target locations.
- Perform injections and monitor performance.
- Evaluate injection results.
- Adjust injectate, injection frequency, or locations as necessary to meet corrective action objectives based on monitoring results.

3.2.1 Injection Treatment Overview

Site-specific laboratory treatability studies using Site aquifer media and impacted groundwater will be performed prior to field implementation of injection treatment. These studies will evaluate multiple viable treatment solutions and a range of doses.

When used to treat localized areas of impact, the extent of exceedances should be defined (delineated) with additional resolution prior to injection. The delineation may include collection of additional groundwater samples through direct-push technology on a grid. Groundwater samples will be screened with field test kits, and a subset of samples will be sent to an analytical laboratory for confirmation analysis.

Because the areas for treatment at the Site are relatively small, pilot- and full-scale implementation are essentially the same. A requisite monitoring period (anticipated to be approximately 1 year) will follow the field implementation. Depending upon the effectiveness of treatment, injections may need to be repeated periodically, though required time between injection treatments is expected to be years (based on other injection treatment precedents).

3.2.1 Site-Specific Injection Treatment Plan

Initial injections will be performed through permanent injection wells. If a second phase of injections is required based on monitoring data, injections will be performed through the permanent injection wells, possibly supplemented by injections performed through direct-push technology, depending upon the extent of the areas that require additional treatment.

Prior to installing injection wells, treatability studies and supplemental data collection must be performed to complete the formulation of the injection solution. Supplementary data collection and evaluation activities planned to be completed as part of implementation include the following:

- Collection of Site soils for batch and column studies from proposed injection areas
- Performance of laboratory treatability studies (batch and column tests) for geochemical manipulation
- Higher-resolution delineation of COIs in injection areas

Laboratory treatability studies will be performed to formulate the treatment solution composition, dose, and sequencing (if sequencing is needed). Specifically, the following tasks are anticipated:

- Batch tests for reagent selection and sequencing
  - Combinations of iron, manganese, and/or magnesium salts at different concentrations mixed with impacted groundwater from the Site
    - Formulations are based on previous successful treatability studies.
    - Multiple formulations have been proven successful for arsenic in field applications and for lithium in laboratory treatability studies.

  - Expected to take approximately 4 to 6 weeks, including post-batch data analysis
- Column tests
  - Apply treatment solution to Site soils based on batch tests.
  - Simulate injection and subsequent precipitation of reactive solids on the alluvial aquifer.
  - Pump impacted groundwater through columns and measure arsenic and lithium in the effluent.
  - After column tests, perform selective sequential extraction (SSE) on soil to determine the treated form of constituents and stability of treatment.
  - Pump background groundwater through treated soils in columns to test for stability (remobilization).
  - Column tests are expected to take approximately 12 weeks, including post-column data analysis.

Prior to implementing geochemical manipulation, the COIs in the injection areas will be further delineated with greater resolution and may include the following procedures:

- Collect groundwater samples through direct-push technology.
  - Sampling grid from impacted wells with holes on 10-foot spacings
  - Two or three depths, based on alluvial aquifer thickness
- Field filter as needed, based on visual observation.
- Screen samples with field test kits for arsenic and lithium; adjust sampling locations as needed.
- Geophysical techniques such as electrical resistivity may be performed over the anticipated treatment area. The geophysical survey would be performed again shortly after treatment. Due to the anticipated conductivity contrast between the treatment solution (higher conductivity) and ambient groundwater, geophysics may be useful in mapping the travel distance of the treatment solution and areal extent of the treatment zone (Halihan et al. 2009).
- Once delineation is refined, and wells are installed in each injection area, injections will be performed.

Existing monitoring wells will be used to monitor the effectiveness of the injection treatment. In addition, based on the hydraulics of the aquifer in the injection area, additional remedial effectiveness monitoring wells will be installed at variable distances to demonstrate injection effectiveness. Monitoring parameters will include COIs and other indicator parameters based on the composition of the treatment solutions. Monitoring frequency will be based on the hydraulics of the aquifer in the areas of interest, distance of the monitoring wells from the line of injection, and associated travel time from the points of injection to monitoring wells.

Figures 7 through 10 provide details regarding the planned injection program in each injection area. The first figure for each injection area provides a plan view of the area identifying the existing monitoring well exhibiting elevated concentrations, locations of planned injection wells spaced approximately 15 feet apart and perpendicular to groundwater flow direction, and performance monitoring points installed approximately 10 feet downgradient of each injection point. The second figure for each injection area provides a cross-sectional depiction of the area and shows well configuration relative to location-specific geology.

The monitoring program for each injection area is expected to include the following components:

- Pre-injection sampling from injection and monitoring wells to establish background
- Post-injection monitoring in select wells at intervals to determine treatment solution behavior, such as 2 days, 1 week, 1 month, 6 months, and annually thereafter, the frequency of which may be adjusted as needed based on data generated
- Sampling for the following constituents during each monitoring event:
  - Field parameters (temperature, pH, oxidation-reduction potential, and specific conductance)
  - Appendix IV constituents and treatment solution indicators such as iron, magnesium, and manganese. Combined radium-226 and -228 will be excluded from monitoring because they are not observed at elevated concentrations at the Site; thus, the burden of additional sample volume, specialized analysis, and additional analysis turnaround time is not warranted.

Data loggers may be installed in select monitoring wells prior to injection to observe changes in groundwater chemistry for indicator parameters (e.g., pH, oxidation-reduction potential, and specific conductance) before, during, and after treatment. Due to the expected conductivity contrast between the treatment solution and groundwater, geophysical methods such as electrical resistivity imaging will be investigated to map the extent of the treatment zone.

3.3 Monitored Natural Attenuation

MNA has been a component of corrective action at RCRA and Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) sites since the 1990s. MNA describes a range of physical, chemical, and biological processes in the environment that reduce the concentration, toxicity, or mobility of constituents in groundwater. For inorganic constituents, the mechanisms of natural attenuation include sorption, dispersion, precipitation and coprecipitation, and ion exchange (USEPA 1999, 2007a, 2007b). MNA as a remedial alternative is dependent on a good understanding of localized hydrogeologic and geochemical conditions and may require considerable information and monitoring over an extended period of time.

USEPA defines MNA as the "reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods" (USEPA 1999, 2015). An MNA evaluation consists of the following steps or tiers (USEPA 2015):

1. Demonstrate that the area of impacts (plume) is stable or shrinking.
2. Determine the mechanisms and rates of attenuation.
3. Determine that the capacity of the aquifer is sufficient to attenuate the mass of constituents in groundwater and that the immobilized constituents are stable and will not remobilize.
4. Design a performance monitoring program based on the mechanisms of attenuation and establish contingency remedies (tailored to site-specific conditions) should MNA not perform as expected.

Where site conditions are conducive to MNA, it has the potential to provide a more sustainable, lower-cost alternative to aggressive remediation technologies such as pump-and-treat. EPRI has prepared a document describing implementation of MNA for 24 inorganic constituents, which include most Appendix III and IV constituents (EPRI 2015).

Attenuation mechanisms can be placed in two broad categories: physical and chemical. Physical mechanisms include dilution, dispersion, flushing, and related processes. All constituents are subject to physical attenuation mechanisms, so physical processes should be considered in MNA evaluations.

When properly implemented, MNA removes constituents from groundwater and immobilizes them onto aquifer solids. Decisions to utilize MNA as a remedy or remedy component should be thoroughly supported by site-specific data and analysis (USEPA 1999, 2015). In addition, though not an MNA tier per se, source control is presumed to precede MNA implementation. Extensive MNA investigations were performed for the Site in 2020 and 2021 and are documented in the *Monitored Natural Attenuation Demonstration* report provided in Appendix D.

Site closure (dewatering, consolidation, and capping) has met the MNA criteria for source control. As described in Section 3.1, the Site has been closed by removing CCR from certain areas and consolidating to reduce the size of the closure footprint. CCR removed from outside the consolidated footprint was dewatered, excavated, and compacted within the consolidated footprint. All visible CCR and a portion of the subgrade soils were excavated outside the consolidated footprint. The final cover of the consolidated footprint has a permeability of 10^{-7} cm/sec or less and was constructed to control and minimize or eliminate (to the extent possible) post-closure infiltration of precipitation into the waste and potential releases of CCR from the unit.

3.3.1 Site-Specific MNA Evaluation Summary

As described in greater detail in Appendix D, the trends observed in concentration versus time and concentration versus distance graphs provide evidence that natural attenuation is occurring at the Site. Recent trends in wells that have SSLs of at least one COI are stable or decreasing with time. Also, concentration versus distance graphs along downgradient transects indicate these COIs are decreasing with distance from the areas with COIs.

Based on the geochemical investigations, several lines of evidence support multiple attenuating mechanisms, depending upon the COIs. The major attenuating mechanisms include:

- Sorption on and/or coprecipitation with iron or manganese oxides for arsenic and lithium
- Ion exchange on clays for lithium
- Precipitation of barium arsenate for arsenic

Rates of attenuation were determined by results of reactive transport modeling and by extrapolating decreasing trends on the concentration versus time graphs to the GWPS for areas where decreasing trends were observed. For lithium, estimated time to achieve GWPSs by MNA is 13 years or less. Depending on location, estimated time to achieve GWPSs by MNA for arsenic ranges from less than 10 years for GSD-AP-MW-4 to approximately 80 years for GSD-AP-MW-2. Though these time frames are reasonable to achieve GWPSs, source control via closure and injection treatment (enhanced attenuation) are expected to shorten the time to achieve GWPSs, particularly in the area of GSD-AP-MW-2. Source control, geochemical manipulation via injections in the two areas with COIs to remove them from groundwater and immobilize them in situ, and MNA over the entire Site are expected to achieve GWPSs in approximately 13 years, which is a reasonable time frame as compared to the other, more aggressive methods investigated as part of the remedy selection process.

Column studies were performed to assess the ability for the aquifer media (soil) to take up COIs. Arsenic and lithium are attenuated by aquifer media, as arsenic in column effluent remained below 25% of the influent concentrations (i.e., 75% to more than 95% removal). Though not as strongly attenuated by aquifer media, lithium removal in the columns was more variable (30% to 90% removal in shallower soils and less than 10% removal in deeper soils), likely reflecting differences in soil mineralogy with depth. Arsenic and lithium attenuation capacity was extrapolated to the entire mass of the aquifer downgradient of the consolidated Site but within the property boundary. The extrapolation showed that the aquifer has an attenuating capacity of many more times the mass of arsenic and lithium requiring attenuation. SSE studies indicate that most of the mass of both COIs occur in the oxidizable and residual fractions, which are very stable attenuation phases. Therefore, remobilization back into groundwater is not expected. Some of the mass of arsenic occurs in the exchangeable fraction, which is somewhat less stable.

3.3.2 Site-Specific MNA Plan

Implementation of MNA at the Site will be relatively easy. MNA monitoring wells are already in place, though MNA monitoring results may indicate that a few additional wells need to be installed to monitor progress in critical areas. The site-specific MNA plan will be composed of the following:

- A network of sentinel or clean-line monitoring points beyond the extent of GWPS exceedances
  - The clean-line network of monitoring wells will be monitored to verify that GWPS exceedances do not occur at or beyond the locations.
- Monitoring wells located within the areas exhibiting GWPS exceedances
  - These wells will be monitored to verify attenuation mechanisms, document decreasing concentrations, calculate plume mass or mass flux, and provide monitoring data to demonstrate MNA effectiveness.
- A comprehensive data analysis and reporting plan identifying specific wells, performance standards, and reporting procedures
- Components of an ASM plan.

A key component of MNA is a detailed monitoring and reporting plan. Pursuant to 40 CFR § 257.98(a) and ADEM Admin. Code r. 335-13-15-.06(9)(a), a remedy and monitoring program must be implemented within 90 days of selecting a remedy. As documented in Appendix D, natural attenuation is already occurring at the Site. A comprehensive and specific MNA monitoring plan document will be developed within 90 days of this report. A conceptual summary of the anticipated MNA monitoring network is included in Figure 11.

MNA monitoring will primarily be accomplished by sampling MNA monitoring wells for the following list of constituents on a semiannual basis:

- Appendix IV constituents
- General parameters that influence geochemistry such as pH, temperature, oxidation-reduction potential, dissolved oxygen, and specific conductivity
- Natural attenuation indicator parameters specific to the identified attenuation mechanisms such as ferrous and ferric iron

Because MNA does not require design and construction of infrastructure, other than the possible installation of additional monitoring wells, the monitoring can be initiated within 6 months to a year. At least 1 year of groundwater monitoring data are recommended to establish baseline conditions and trends.

4 Corrective Action Monitoring Plan

As required by 40 CFR § 257.98(a) and ADEM Admin. Code r. 335-13-15-.06(9)(a), the owner/operator must implement the groundwater remedy within 90 days of selecting a remedy, including establishing a corrective action groundwater monitoring program that: 1) meets the assessment monitoring requirements of 40 CFR § 257.95 and ADEM Admin. Code r. 335-13-15-.06(6); 2) documents the effectiveness of the remedy; and 3) demonstrates compliance with the GWPS. A conceptual groundwater monitoring network is shown in Figure 11.

Assessment monitoring of the certified groundwater monitoring network must continue pursuant to 40 CFR § 257.96(b) and ADEM Admin. Code r. 335-13-15-.06(7)(b). The corrective action groundwater monitoring program will include groundwater monitoring for the following:

- Assessment monitoring of the certified CCR compliance groundwater monitoring network
- An injection treatment system
  - Injection performance
  - ASM triggers
- MNA
  - Attenuation mechanisms, plume reduction, and mass/concentration reduction
  - ASM triggers
- Sentinel/clean-line boundary monitoring
  - Verify delineation boundaries
  - Potential receptor monitoring using risk-based screening levels
  - ASM triggers

Within 90 days of selecting a remedy, a corrective action groundwater monitoring program will be developed that describes the following in detail:

- Sample locations
- Monitoring schedule
- Monitoring parameters
- Data analysis methods
- Interim adaptive standards (for ASM)
- Reporting and notification requirements

Following implementation of the ACM, several wells were installed to complete delineation and have been monitored semiannually pursuant to 40 CFR § 257.95(g)(1) and ADEM Admin. Code r. 335-13-15-.06(6)(g)2. Ongoing monitoring of certain delineation monitoring wells may be discontinued when the final corrective action groundwater monitoring program is developed.

Sentinel/clean-line boundary monitoring points will be located between known GWPS exceedances and the property boundary or potential receptors. The frequency at which these wells will be sampled will be the same as for the CCR compliance monitoring wells. Conceptual sentinel/clean-line monitoring points are shown in Figure 11. Adaptive triggers could include statistically increasing trends for multiple events and verified GWPS exceedances at clean-line boundary monitoring points.

Remedy performance monitoring wells will be used to evaluate the combined effects of source control (Site closure), injection treatment, and MNA. Conceptual remedy performance monitoring wells are shown in Figure 11. The number and distribution of monitoring wells are sufficient to assess natural attenuation, so no new MNA wells will be installed unless monitoring data indicate additional wells are needed.

As discussed in Section 5, APC will incorporate ASM into the corrective action at the Site. Adaptive triggers will be developed, and additional actions (monitoring, analysis, and/or corrective action) will be implemented as needed. Adaptive triggers could include exceedance of GWPSs at sentinel/clean-line monitoring points for multiple events or statistically increasing trends above GWPSs for multiple events in other areas. These details will be provided in the Site *Corrective Action Groundwater Monitoring Program* to be submitted 90 days after submission of this *Groundwater Remedy Selection Report*.

5 Adaptive Site Management Plan

Changes in Site conditions are inevitable with the long-term performance of groundwater remedies. 40 CFR § 257.98(b) and ADEM Admin. Code r. 335-13-15-.06(9)(b) require an owner or operator to implement other methods or techniques if it is determined that compliance is not being achieved by the existing remedy. Remedy system performance will be proactively and systematically monitored against interim performance standards (sometimes called "adaptive triggers") in accordance with the ASM plan to ensure compliance with 40 CFR § 257.98(b) and ADEM Admin. Code r. 335-13-15-.06(9)(b) requirements and provide a process for proactively responding to changing conditions. Details regarding implementation of the ASM will be included in the comprehensive *Corrective Action Groundwater Monitoring Program*.

The ASM for the Site will include the following:

- Implementing interim/short-term goals to measure system performance and progress toward long-term goals
- Evaluating remedy system performance against interim goals (adaptive triggers)
- Adapting when performance metrics are satisfied, or interim goals are not met
- Updating the Site conceptual model as new data become available
- Re-evaluating and updating interim goals (adaptive triggers)
- Adapting the corrective action system (CAS) if necessary

The performance of the groundwater CAS at the Site will be subject to routine evaluation and, if necessary, adjustment as part of the ASM. Figure 12 presents the process that will be used to evaluate monitoring data, determine if performance objectives are met, and determine if adaptation of the CAS is needed. Performance monitoring is an integral component of the ASM. Details regarding the performance monitoring systems, performance criteria, adaptive triggers, and evaluation criteria will be provided in the comprehensive *Corrective Action Groundwater Monitoring Program* developed for the Site within 90 days pursuant to 40 CFR § 257.98(a) and ADEM Admin. Code r. 335-13-15-.06(9)(a).

The purpose of the ASM plan is to identify objective data targets that may be used to evaluate the effectiveness of the CAS. The ASM process is applicable at all stages of corrective action as follows (Figure 12):

- The CAS described herein will be implemented to address current conditions.
- Monitoring will occur, and system performance will be evaluated with respect to interim and long-term performance standards (adaptive triggers) that signal a re-evaluation of performance standards or adjustment to the CAS may be warranted.

- If monitoring indicates interim standards have not been met, those performance standards will be re-evaluated, and a determination made regarding their continued suitability, if they need to be adjusted, or if the CAS needs to be adapted.
- Adjustments will be made to the adaptive triggers or CAS, as needed, to ensure that long-term (final) performance criteria and remedial goals are met.
- The conceptual site model will be updated as additional data are obtained.
- Implementation of the CAS, monitoring, and ASM plan will continue until the final long-term objectives are met.

5.1 Interim Performance Standards and Monitoring

The long-term performance standards for the CAS are defined in 40 CFR § 257.98(c) and ADEM Admin. Code r. 335-13-15-.06(9)(c): demonstrate compliance with the GWPS at all points that lie beyond the groundwater monitoring system established under 40 CFR § 257.91 and ADEM Admin. Code r. 335-13-15-.06(2) for three consecutive years based on semiannual monitoring.

Interim performance standards and adaptive triggers are developed to evaluate the effectiveness of the CAS in furtherance to meeting the long-term performance standards. As described in Section 3, in addition to closure and source control, the CAS is composed of injection treatment and MNA. Monitoring frequency of CAS components will vary as described in the *Corrective Action Groundwater Monitoring Program*. Performance monitoring reporting will occur at least semiannually.

5.1.1 Injection Treatment

Injection treatment is designed to remove constituents from groundwater by precipitation or sorption via a treatment solution injected into the area of impact. The interim performance goal of the injection treatment system is to document a reduction in constituent concentrations in groundwater and distribution of the treatment solution within the uppermost aquifer. The long-term performance objective is to demonstrate sustained constituent concentration reductions after injection of treatment solution has ceased. The monitoring plan for injections will be developed after treatability studies because those studies are needed to select treatment solutions and the associated monitoring parameters.

5.1.2 Monitored Natural Attenuation

The long-term goal of MNA is to document that, in conjunction with source control and injection treatment, natural attenuation of the constituents is occurring. The MNA performance monitoring network and adaptive triggers will be described in detail within the *Corrective Action Groundwater Monitoring Program*. As described by USEPA (2015), the four tiers of MNA can be summarized as:

- Tier 1: plume size/stability
- Tier 2: attenuation mechanisms and rates

- Tier 3: attenuation mechanism capacity and reversibility
- Tier 4: performance monitoring plan

The suitability of MNA has been demonstrated as described in Section 3.3.1 and Appendix D. The performance of the MNA (Tiers 1 through 3) will be monitored by evaluating the following:

- Source control mechanisms
  - Section 3.1 describes how source control at the Site has been completed by way of consolidating the former Site footprint and constructing the final cover system.
- Plume size and stability
  - The size and stability will be monitored by a network of groundwater monitoring wells within and around the perimeter of the area of groundwater exceedances (i.e., the plume). From a practical implementation standpoint, plume stability refers to an area of groundwater impacts that is not substantially expanding or adversely changing (by exhibiting new constituents or increasing mass). The interim performance standard for plume stability may be monitoring of wells installed around the areas of groundwater impacts to exhibit trends that are statistically steady or decreasing and for no new SSLs to occur within the plume area. The long-term performance objective is for statistically decreasing trends, continual reduction in the number or SSLs in the MNA performance monitoring network, a reduction in size of the plume, and/or a reduction in magnitude of COIs within the plume.
- Plume mass and mass reduction
  - MNA performance relative to Tier 2 criteria for attenuation mechanisms and rates and Tier 3 criteria for attenuation capacity and reversibility may be demonstrated by monitoring the mass of each COI within the plume area and documenting changes in mass over time. Steady or decreasing mass indicates that attenuation mechanisms continue to be effective, attenuation capacity remains, and attenuation mechanisms have not reversed. The interim performance standard for mass reduction is for monitoring wells installed in and around the areas of groundwater impacts, in aggregate, to exhibit statistically steady or decreasing mass. Per USEPA guidance, mass flux across transects (cross sections) located in meaningful areas will also be calculated. The long-term performance objective is to demonstrate COI concentration decline to below GWPS and reduce COI mass.

Adjustments to the MNA performance monitoring network will be made as MNA proceeds.

5.2 Adaptive Triggers

Detailed performance monitoring requirements for each component of the CAS will be included in the *Corrective Action Groundwater Monitoring Program.* Included in the performance monitoring plan will be the objective performance standards that serve as adaptive triggers. Should the performance standard not be met, the adaptive trigger will signify that re-evaluation of the performance standards and CAS are warranted.

5.3 Corrective Action System Adaptation

If it is determined that the performance objectives are appropriate and that the CAS is not achieving the interim or long-term goals, then the CAS may be adapted, optimized, or changed. Within a reasonable time, depending on complexity and need, changes to the CAS and associated workplan or implementation schedule will be provided. A semiannual report describing the progress made adapting the CAS will be completed and placed in the operating record as required by 40 CFR § 257.105(h)(12) and ADEM Admin. Code r. 335-13-15-.08(1)(h)12. Amendments to this *Groundwater Remedy Selection Report* and *Corrective Action Groundwater Monitoring Program* will also be completed and placed in the operating record as described in 40 CFR § 257.105(h)(12) and ADEM Admin. Code r. 335-13-15-.08(1)(h)12.

6 Remedy Performance Requirement Demonstration

As required in 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b), the groundwater remedy for the Site must meet the following performance standards:

1. Be protective of human health and the environment.
2. Attain applicable GWPSs as specified in the rules.
3. Control the source of release to reduce or eliminate, to the extent feasible, further releases to the environment.
4. Comply with any relevant standards (i.e., all applicable RCRA requirements) for management of wastes generated by the remedial actions.

The following describes how the selected remedy plan meets the performance requirements of 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b).

6.1 Protection of Human Health and the Environment

A remedy is protective of human health and the environment when a quantitative risk assessment, conducted according to well-supported scientific principles, demonstrates that chemicals in relevant environmental media are at or below regulatory and/or health-based benchmarks for human health and the environment. Quantitative risk assessment approaches and the derivation of health-based benchmarks may vary by the competent authority or regulatory application. The State of Alabama has several reports that provide specific guidance on risk assessment approaches and the selection/derivation of appropriate health-based benchmarks for chemicals in groundwater and surface water that will be protective of human health and the environment

Current conditions are protective of human health and the environment. The proposed remedy plan will improve groundwater quality and result in a reduction in concentrations; therefore, the proposed remedy will be protective of human health and the environment as required by 40 CFR § 257.97(b)(1) and ADEM Admin. Code r. 335-13-15-.06(8)(b)1.

6.2 Attain Groundwater Protection Standard Requirements

As stated in 40 CFR § 257.97(b)(2) and ADEM Admin. Code r. 335-13-15-.06(8)(b)2., a groundwater remedy plan must be able to attain the GWPS specified in the rules. As described in this report, a three-pronged approach will be used to achieve the GWPS. A significant component of the groundwater remedy plan is the closure and source control measures being implemented at the Site. The combination of CCR consolidation, dewatering, and installation of a low-permeability geosynthetic cover system has reduced further release to groundwater.

Injection treatment of the two areas with arsenic and lithium in groundwater will reduce concentrations by creating precipitates (solids) that remove COIs from the groundwater. Injection treatment was based on successful field treatments for arsenic and successful laboratory treatability studies from other sites for lithium (Anchor QEA 2017, 2018, 2019a, 2019b; EPRI 2021). Effectiveness of injection treatments will be evaluated in the context of decreasing trends from source control and natural attenuation. If warranted, injection treatments will be repeated on a frequency determined to be necessary based on remedial effectiveness monitoring data.

Finally, as discussed in Section 3.3.2 and Appendix D, COIs are currently being attenuated, and concentrations are declining as a result of natural attenuation processes. In concert with closure/source control and treatment injections, MNA will continue until COI concentrations are below the GWPS. Closure activities and injection treatments will serve to enhance the already-occurring natural attenuation.

Remedy evaluation, including transport modeling along transects and projection of current natural attenuation trends, has demonstrated that actions proposed for the Site will result in decreasing concentrations in groundwater (Appendix D). Decreasing concentrations will ultimately result in constituents occurring at concentrations below the GWPS. Therefore, as required by 40 CFR § 257.97(b)(2) and ADEM Admin. Code r. 335-13-15-.06(8)(b)2., the groundwater remedy plan will be able to attain the GWPS specified in the rules.

Source control, geochemical manipulation via injections in the two areas with COIs to remove them from groundwater and immobilize them in situ, and MNA over the entire Site are expected to achieve GWPSs in approximately 13 years, which is a reasonable time frame as compared to the other, more aggressive methods investigated as part of the remedy selection process. Pump-and-treat for inorganic constituents, for example, typically takes decades because that process must reverse the natural attenuation processes already operating by desorbing constituents from aquifer solids by passing many pore volumes (sometimes hundreds) through the aquifer. Supporting information for time to attain GWPSs, including concentration versus time and concentration versus distance graphs, and transport modeling, is included in Appendix D. Source control and geochemical manipulation (injections) are expected to accelerate this time frame, particularly in areas where little attenuation is currently observed.

6.3 Control Sources of Releases

Site closure will reduce potential discharges to groundwater as required by 40 CFR § 257.97(b)(3) and ADEM Admin. Code r. 335-13-15-.06(8)(b)3. Source control was accomplished by:

1. Dewatering and consolidating the CCR material: slopes were graded to provide stability, promote drainage, and prevent ponding in the disposal area.
2. Placing final cover, consisting of an engineered synthetic turf and geomembrane, over the disposal area: the low-permeability cover system will promote and control runoff from the disposal area and prevent infiltration. Eliminating infiltration will prevent the mobilization of

constituents within the disposal unit and further reduce the potential for future releases from the Site.

The closure activities have begun improving groundwater quality by reducing the source area, preventing infiltration of water, minimizing the mobilization of constituents, and impeding release to the environment. The closure and source control measures meet the requirements of 40 CFR § 257.97(b)(3) and ADEM Admin. Code r. 335-13-15-.06(8)(b)3. and will continue to control the source of release to reduce or eliminate, to the extent feasible, further releases to the environment.

6.4 Standards for Waste Management

As specified in requirements of 40 CFR § 257.97(b)(5) and ADEM Admin Code r. 335-13-15-.06(8)(b)5., any waste must be handled and disposed according to all applicable requirements under RCRA. Specifically, any liquid or solid waste generated must be handled and disposed according to applicable regulations in 40 CFR parts 239 through 282 and ADEM Admin. Code Ch. 335-13-1 through 335-13-16.

Based on the technologies selected, very little waste will be generated. Waste may be generated by additional well installations, completing injections, and monitoring. All waste generated during completion of the remedy will be handled and disposed according to RCRA requirements for the type of waste. Therefore, the remedy plan meets the requirements of 40 CFR § 257.97(b)(5) and ADEM Admin. Code r. 335-13-15-.06(8)(b)5. for managing waste generated by the remedy.

As demonstrated here, the groundwater remedy plan meets the performance criteria of 40 CFR § 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b).

7 Schedule

The following factors were considered when determining the schedule for remedial activities as required by 40 CFR § 257.97(d)(1 through 5) and ADEM Admin. Code r. 335-13-15-.06(8)(d)(1 through 5):

- Extent and nature of exceedances
- Reasonable probabilities of remedial technologies in achieving compliance with CCR rule GWPSs and other objectives of the remedy
- Availability of treatment or disposal capacity for CCR managed during implementation of the remedy (not applicate for the Site)
- Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy
- Resource value of the aquifer

In accordance with 40 CFR § 257.97(d) and ADEM Admin. Code r. 335-13-15-.06(8)(d), the following schedules are provided for implementing and completing remedial activities at the Site.

7.1 Site Closure and Source Control

Construction activities associated with Site closure were substantially completed in August 2018. ADEM issued formal written approval on February 25, 2020.

7.2 Injection Treatment

The anticipated injection treatment implementation schedule is included below and summarized in Figure 13. Prior to beginning injections, APC will secure an Underground Injection Control (UIC) Class V permit after submitting a well permit application to ADEM. The application package will be prepared in accordance with ADEM's "UIC Class V Well Permit Application Requirements Guidance" (ADEM 2021) and include the following information:

- Contact information for the permit applicant and responsible official
- Site name and address
- A map(s) that shows the location of proposed injection well(s); public and private water supply wells; source water assessment areas; well head protection areas; surface waters; and other pertinent surface features such as roads, natural or manufactured drainage courses, residences, and other structures within the area of review
- A description of the fluids to be injected and the proposed operational procedures
- Design, plans, specifications, and other pertinent information (including injection wells and a groundwater monitoring plan)
- Hydrogeologic data

For treatability studies and the UIC permit, the following schedule is anticipated:

- Collect soil and groundwater samples for treatability studies: 1 month
- Conduct batch studies for reagents and doses: 4 to 6 weeks
- Conduct column studies for effectiveness: 3 months
- Prepare Class V UIC permit: 3 months

After securing the proper ADEM UIC permit, the following schedule is anticipated:

- Design field implementation of injection treatment: 1 month
- Refine delineation in the field: 2 weeks
- Field implementation (well installation and injections): 1 month
- Collect and analyze remedial effectiveness monitoring data: 15 months

7.3 Monitored Natural Attenuation

Strictly speaking, the MNA process is currently being implemented at the Site, although a formalized process to evaluate and document the process has not yet been established. MNA will be implemented by establishing the detailed MNA sampling, analysis, and evaluation plan within 90 days as part of the groundwater remedy monitoring plan. Implementation of the MNA program is anticipated to include the following:

- Coordinate MNA sampling with the first semiannual compliance sampling event after new well installation
- Collect and analyze baseline data: 1 year
- Estimated remedy completion: 13 years, considering the benefits of source control via closure and injection treatments in the two areas with COIs

8 References

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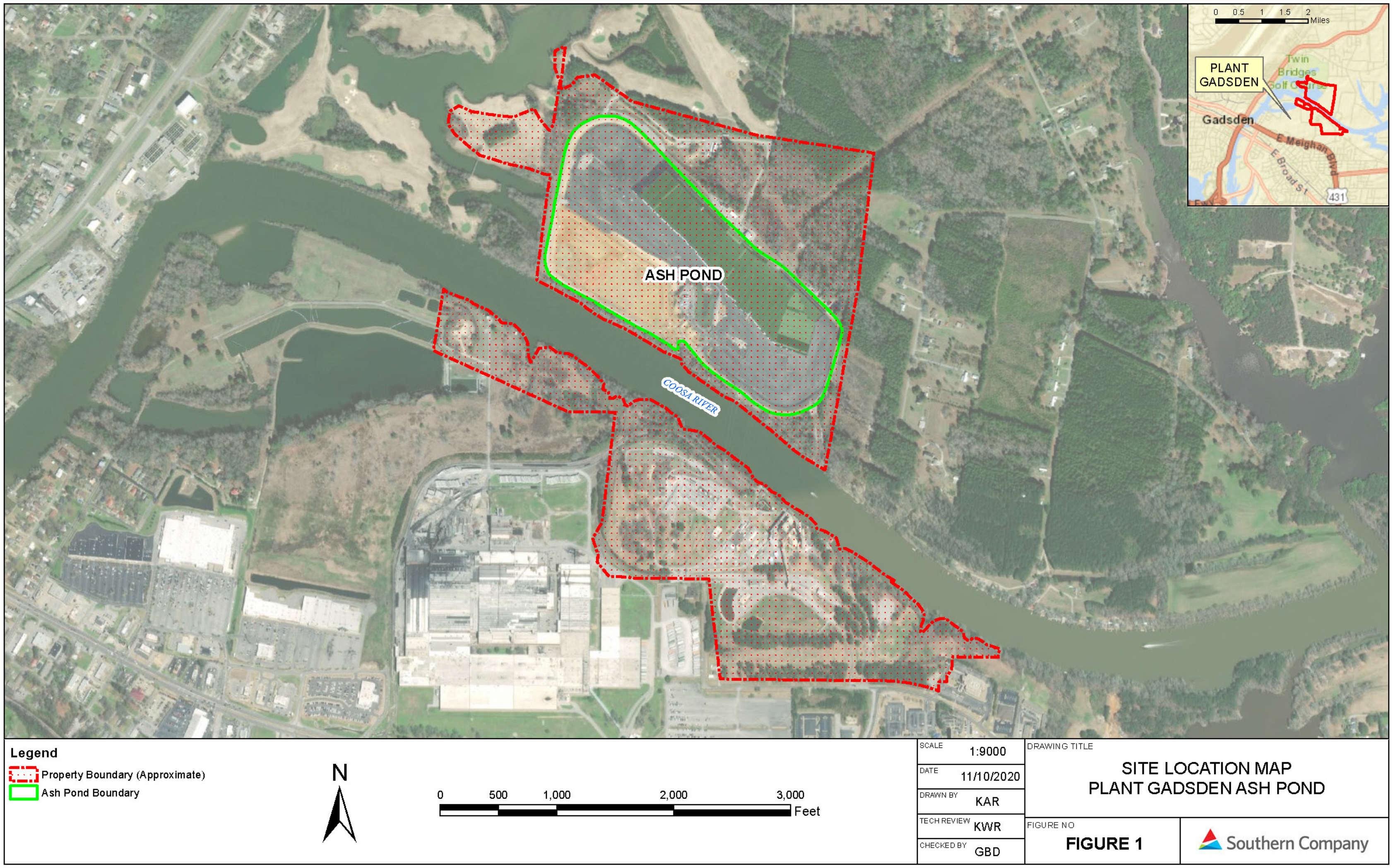
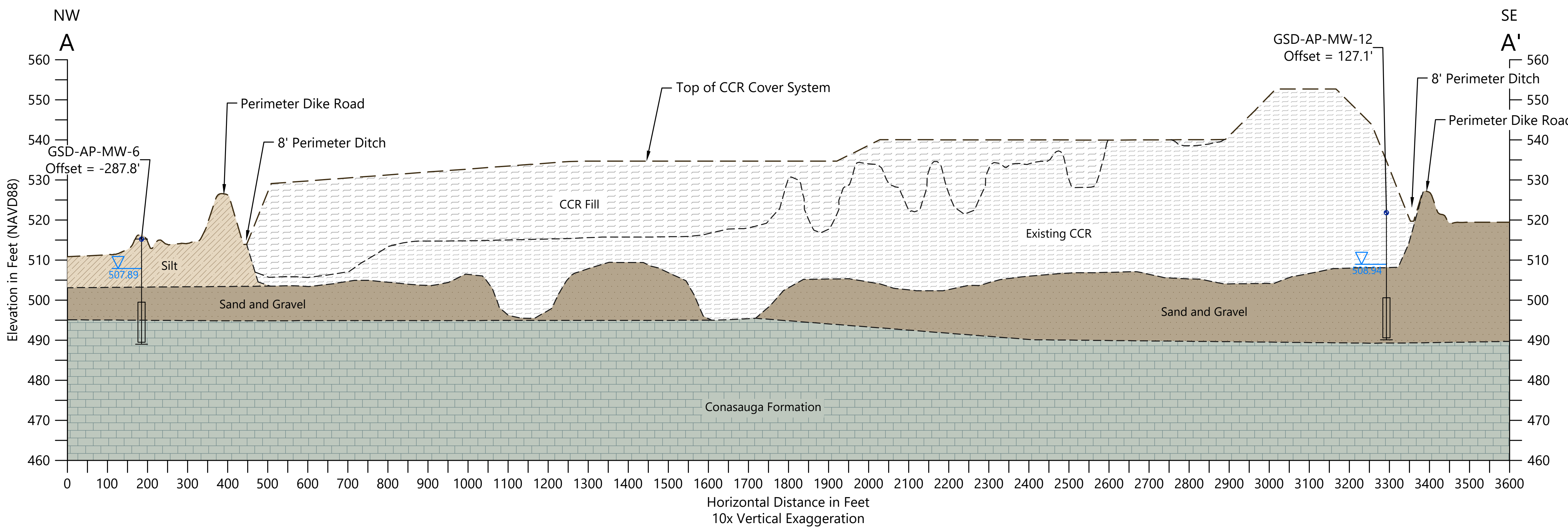
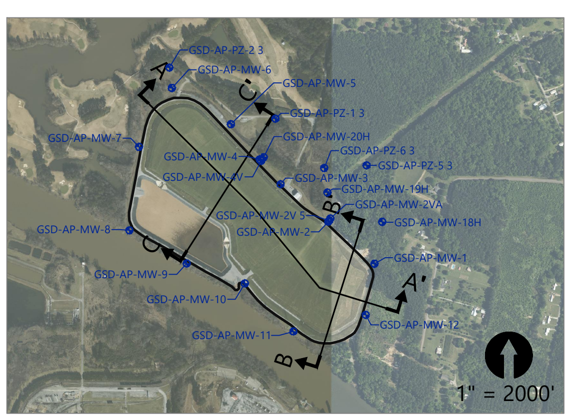
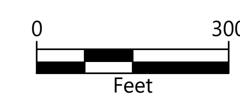
Figures



Source: Southern Company Services, 2021. *2020 Semi-Annual Groundwater Monitoring and Corrective Action Report.* Plant Gadsden Ash Pond. Prepared for Alabama Power Company. February 1, 2021.







LEGEND:

Existing Ground Surface

Geologic Contact

Existing Monitoring Well

Water Elevation (Collected August 19, 2019)

Screened Interval

NOTES:
1. Water elevations measured on August 19, 2019.
2. Designed features are based on Plant Gadsden CCR Pond Closure, Etowah County, Alabama, Southern Company Generation Engineering and Construction Services, March 14, 2016.
3. CCR: Coal Combustion Residuals

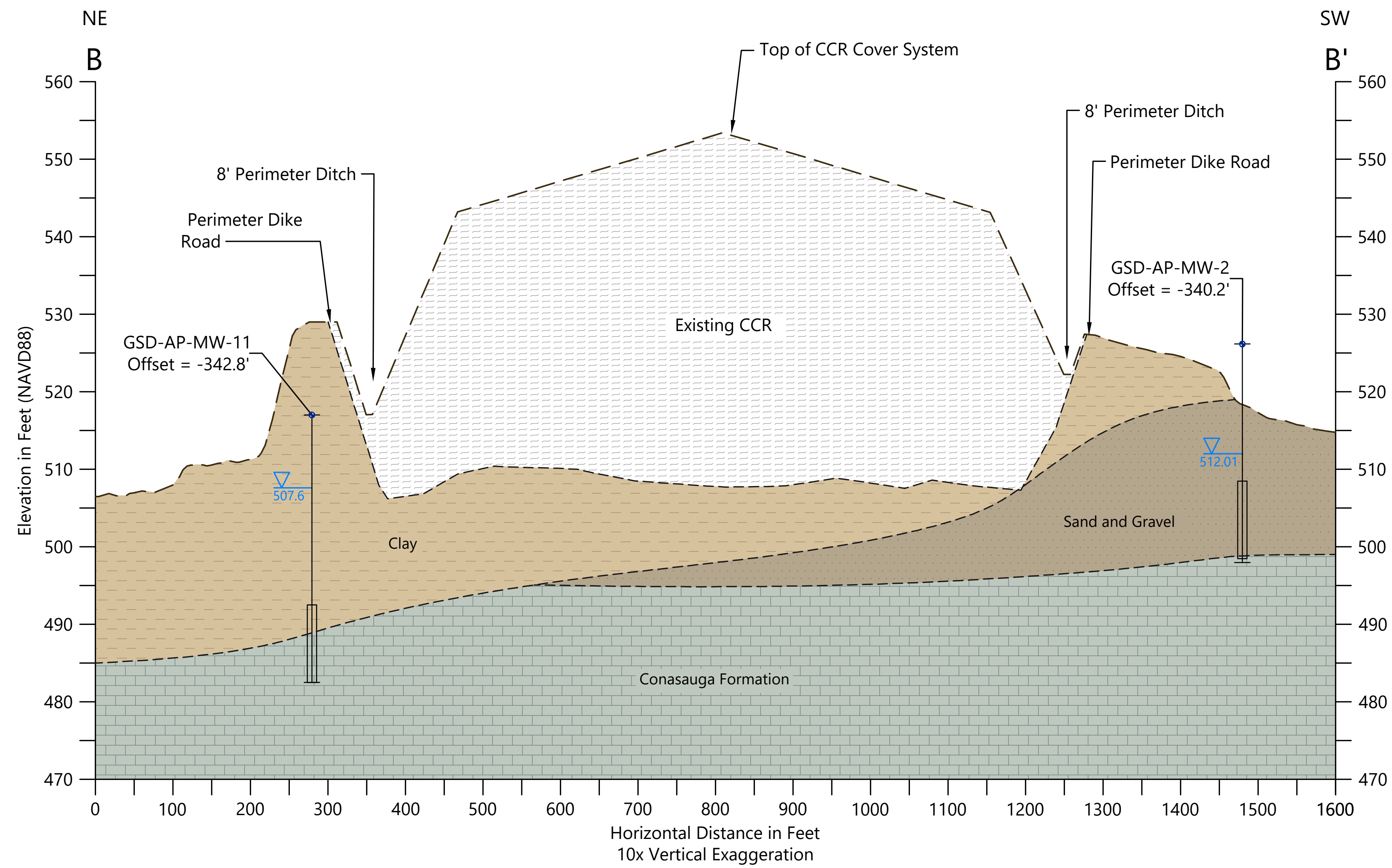
HORIZONTAL DATUM: Alabama State Plane West Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: North American Vertical Datum of 1988 (NAVD88)

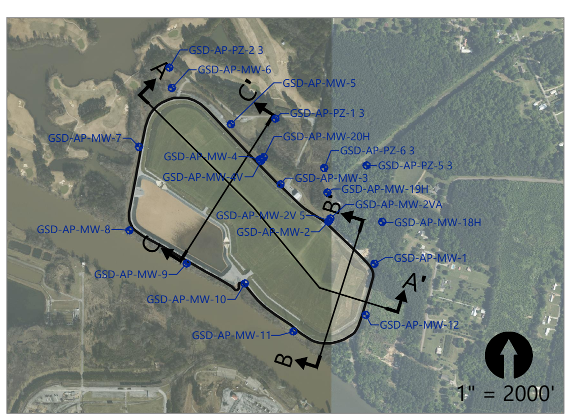
Publish Date: 2021/10/27 11:23 AM | User: hmerrick
Filepath: K:\Projects\1114-Southern Company\Gadsden\1114-RP-002 (Gadsden Sections).dwg Figure 2

ANCHOR QEA

Figure 2
Closure Cross Section A-A'

Groundwater Remedy Selection Report
Plant Gadsden





0 200
Feet

LEGEND:

Existing Ground Surface

Geologic Contact

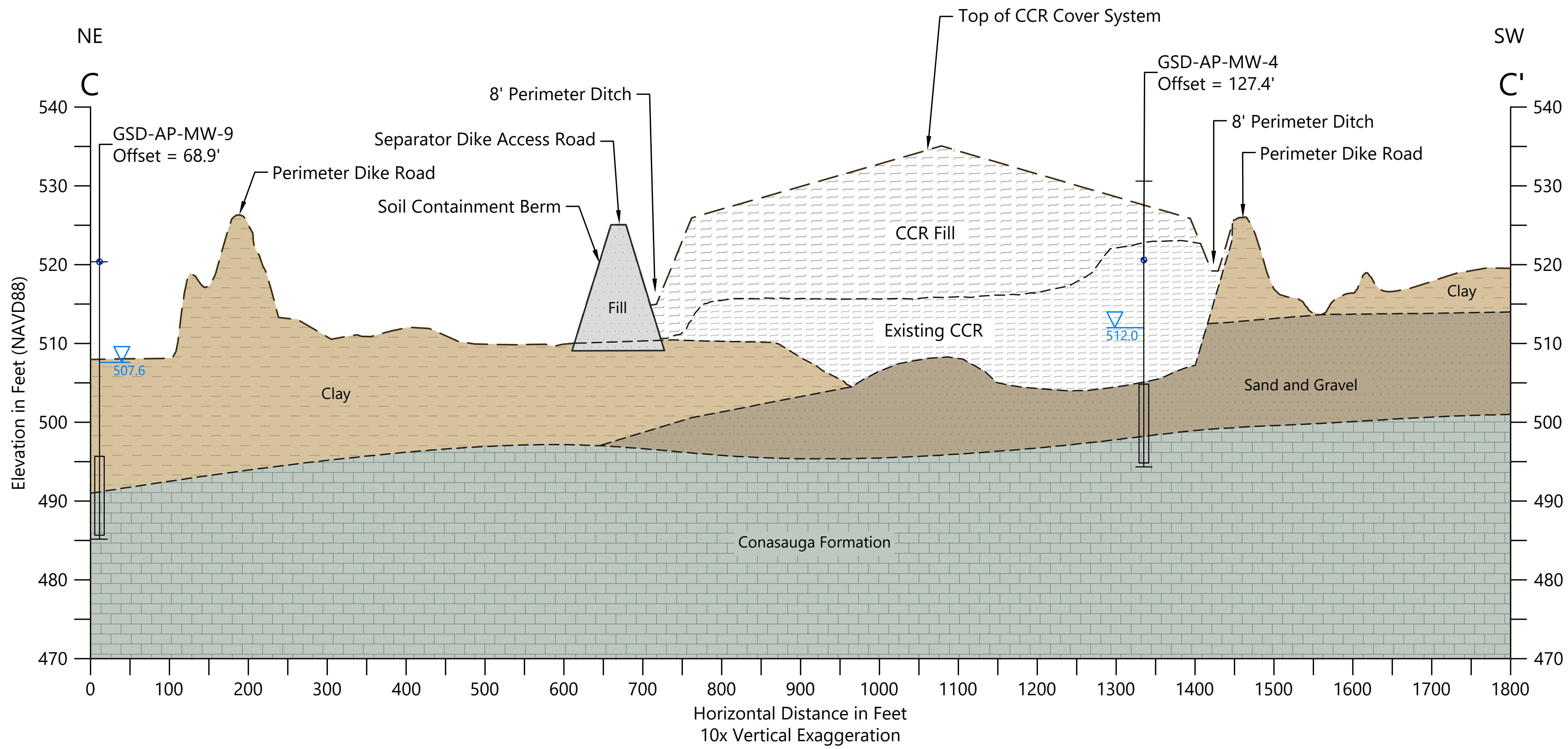
Existing Monitoring Well

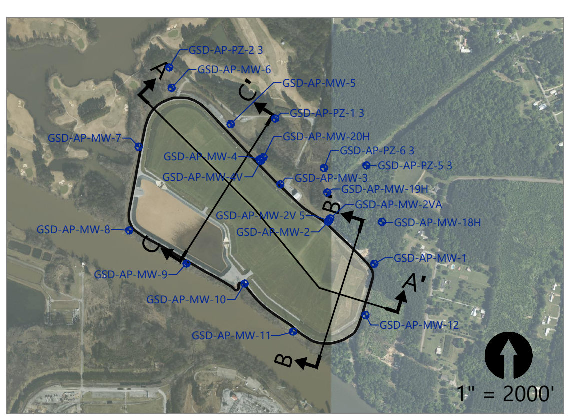
Water Elevation
(Collected August 19, 2019)

Screened Interval

NOTES:
1. Water elevations measured on August 19, 2019.
2. Designed features are based on Plant Gadsden CCR Pond Closure, Etowah County, Alabama, Southern Company Generation Engineering and Construction Services, March 14, 2016.
3. CCR: Coal Combustion Residuals

HORIZONTAL DATUM: Alabama State Plane West Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: North American Vertical Datum of 1988 (NAVD88)





0 200
Feet

LEGEND:

Existing Ground Surface

Geologic Contact

Existing Monitoring Well

Water Elevation (Collected August 19, 2019)

Screened Interval

NOTES:

1. Water elevations measured on August 19, 2019.
2. Designed features are based on Plant Gadsden CCR Pond Closure, Etowah County, Alabama, Southern Company Generation Engineering and Construction Services, March 14, 2016.
3. CCR: Coal Combustion Residuals

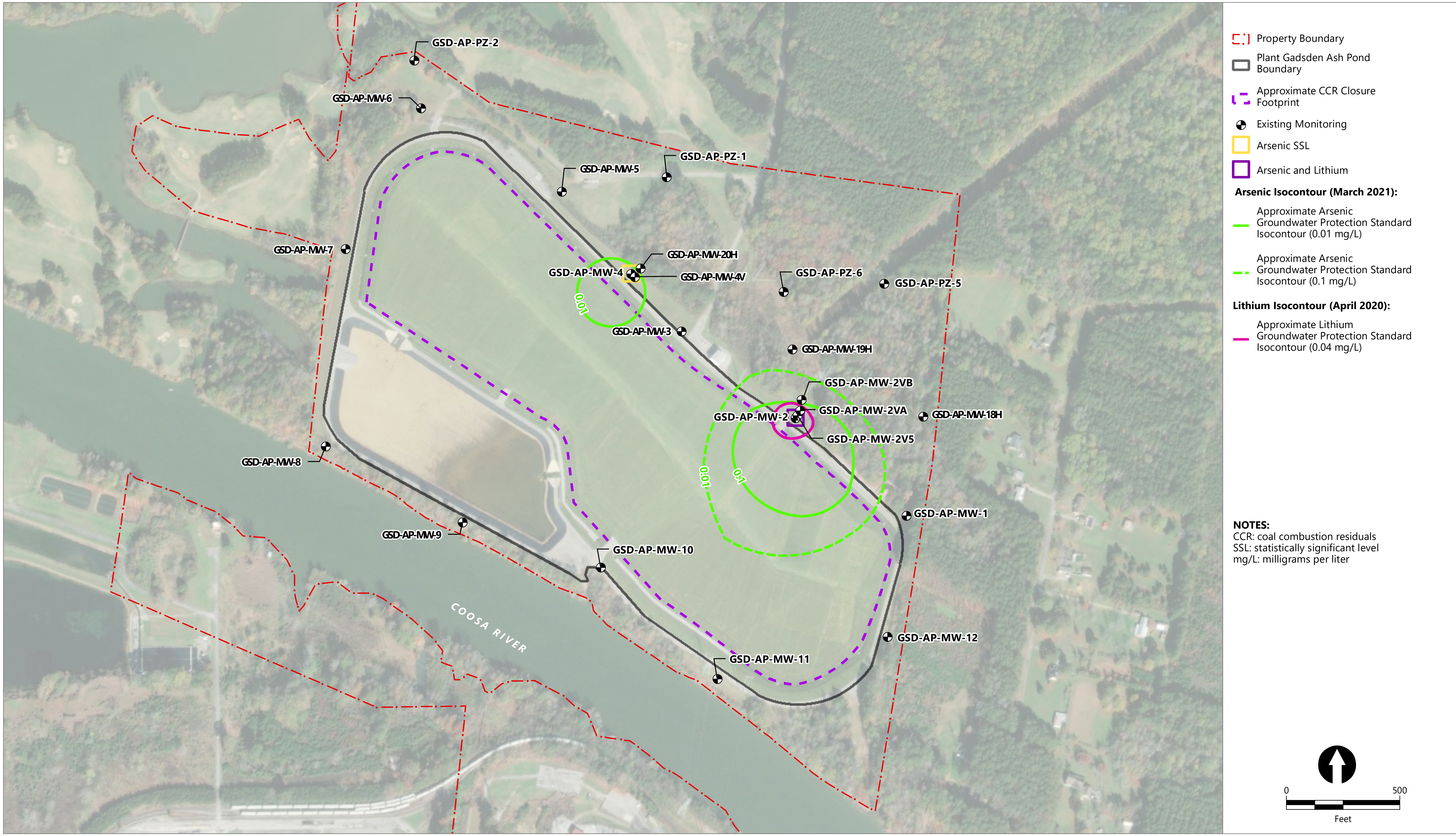
HORIZONTAL DATUM: Alabama State Plane West Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: North American Vertical Datum of 1988 (NAVD88)

Publish Date: 2021/10/27 11:22 AM | User: hmerrick
Filepath: K:\Projects\1114-Southern Company\Gadsden\1114-RP-002 (Gadsden Sections).dwg Figure 4

ANCHOR QEA

Figure 4
Closure Cross Section C-C'

Groundwater Remedy Selection Report
Plant Gadsden



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ANCHOR QEA

Figure 5
Groundwater Protection Standard Exceedance Map
Groundwater Remedy Selection Report
Plant Gadsden

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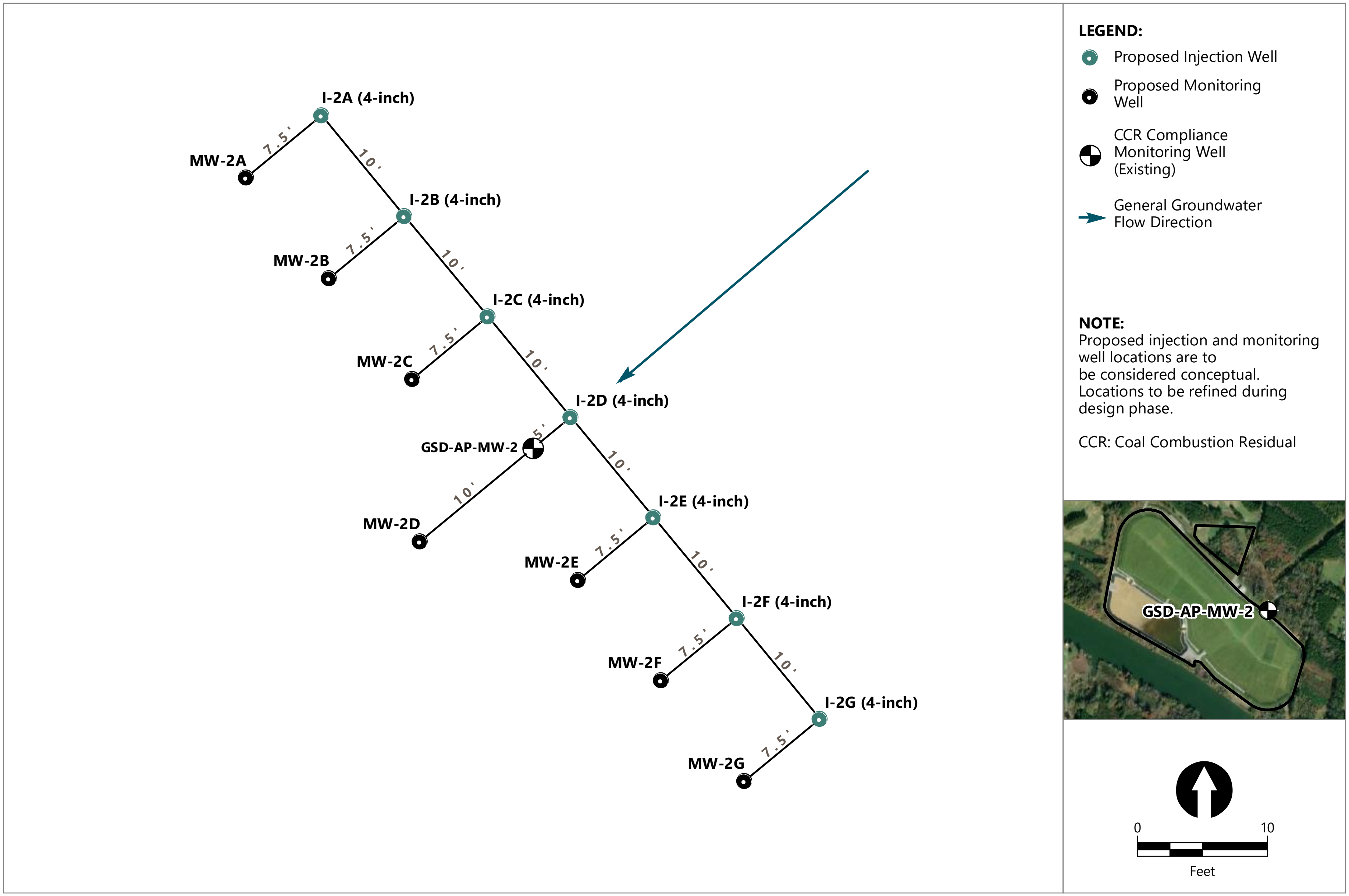
ANCHOR QEA

Figure 6
Injection Treatment Areas
Groundwater Remedy Selection Report
Plant Gadsden



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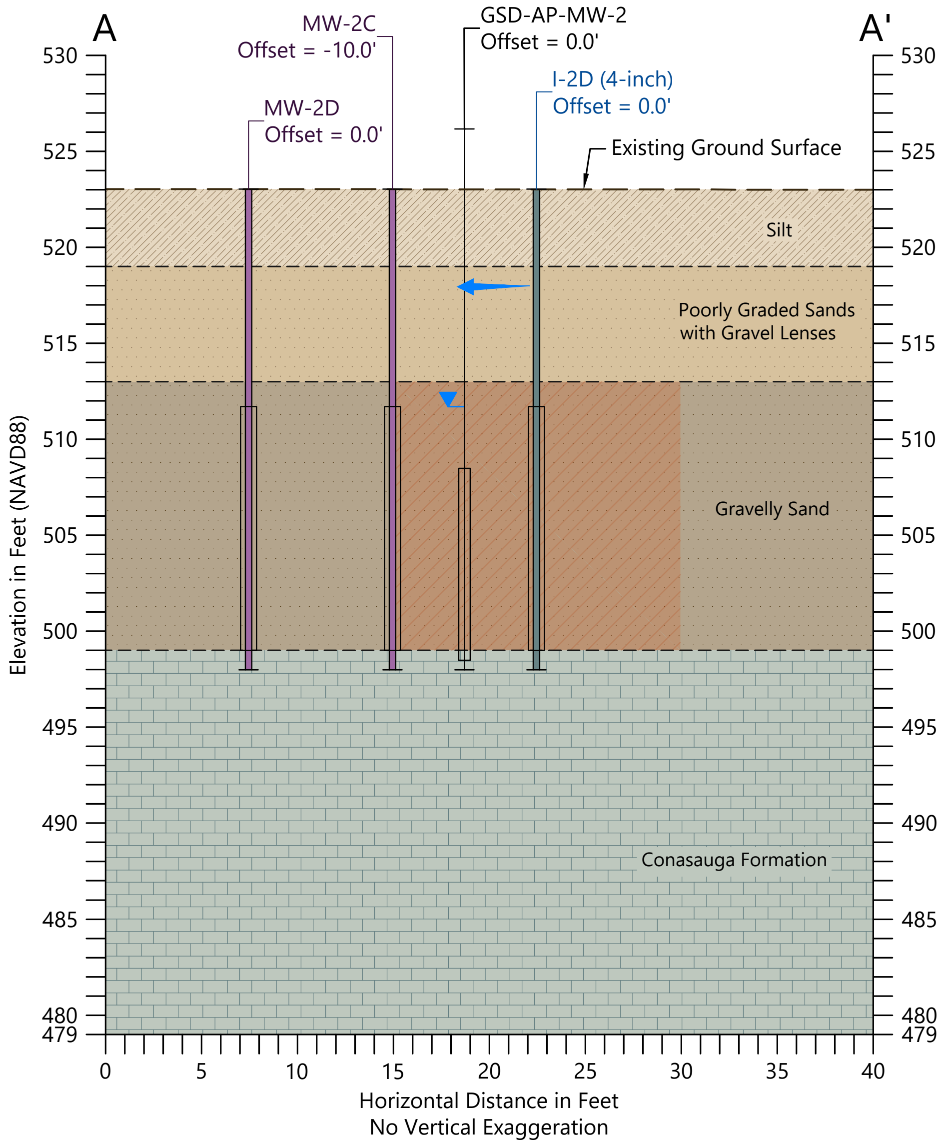
ANCHOR QEA

Figure 7
Injection and Monitoring (Plan View): GSD-AP-MW-2
Groundwater Remedy Selection Report
Plant Gadsden



LEGEND:

Groundwater Flow Direction

Geologic Contact

Anticipated Radius of Influence

Proposed Monitoring Well

Screened Interval

Proposed Monitoring Well

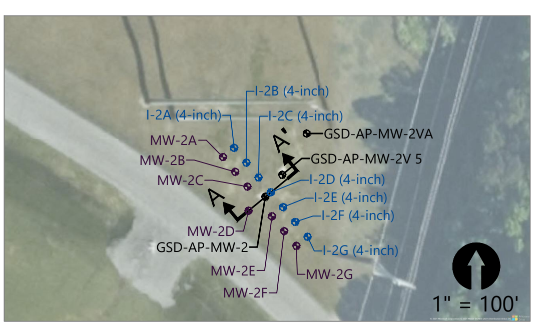
Screened Interval

Existing Monitoring Well

Water Elevation

Screened Interval

0 10
Feet



NOTE: Proposed injection and monitoring well locations are to be considered conceptual. Locations to be refined during design phase.
HORIZONTAL DATUM: Alabama State Plane East Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: NAVD88

Publish Date: 2021/10/27 9:30 AM | User: hmerrick
Filepath: K:\Projects\1114-Southern Company\Gadsden\1114-RP-001 (Gadsden Inj Well Sections).dwg Figure 8

ANCHOR QEA

Figure 8
Injection and Monitoring (Cross Section): GSD-AP-MW-2

Groundwater Remedy Selection Report
Plant Gadsden

Publish Date: 2021/10/18, 1:59 PM | User: jquinley
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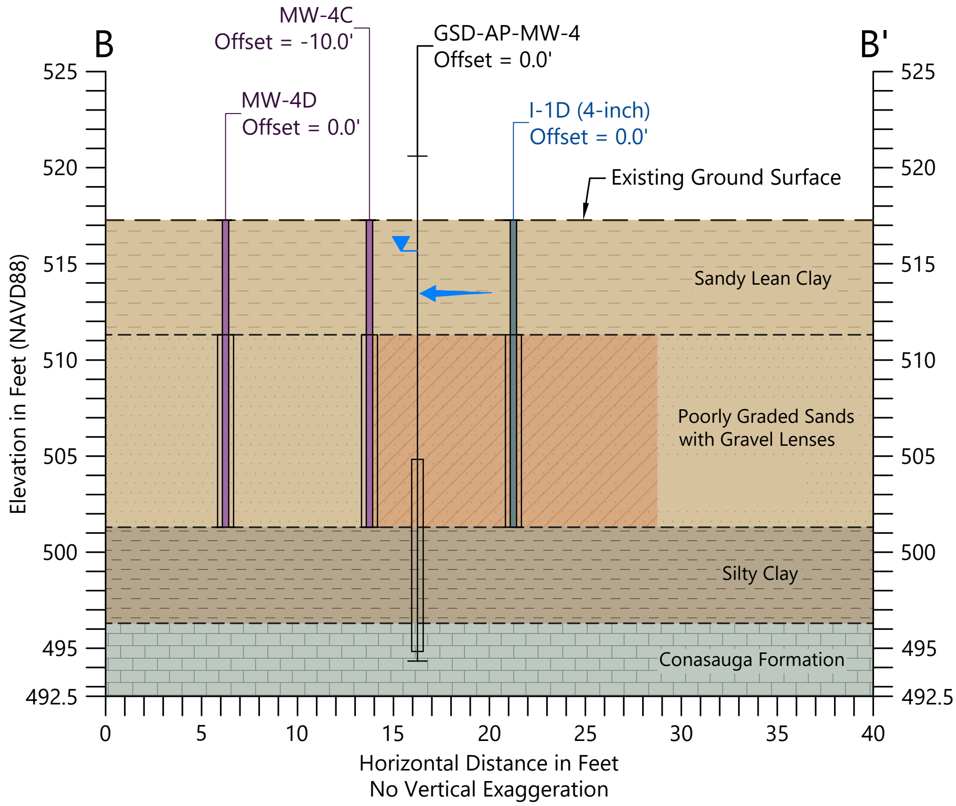
ANCHOR QEA

Figure 9
Injection and Monitoring (Plan View): GSD-AP-MW-4
Groundwater Remedy Selection Report
Plant Gadsden



LEGEND:

Groundwater Flow Direction

Geologic Contact

Anticipated Radius of Influence

Proposed Monitoring Well

Screened Interval

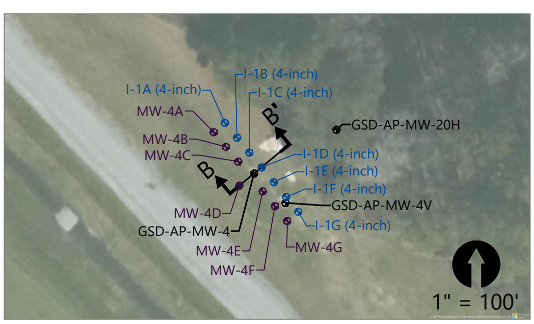
Proposed Monitoring Well

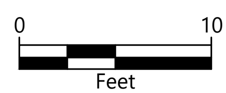
Screened Interval

Existing Monitoring Well

Water Elevation

Screened Interval



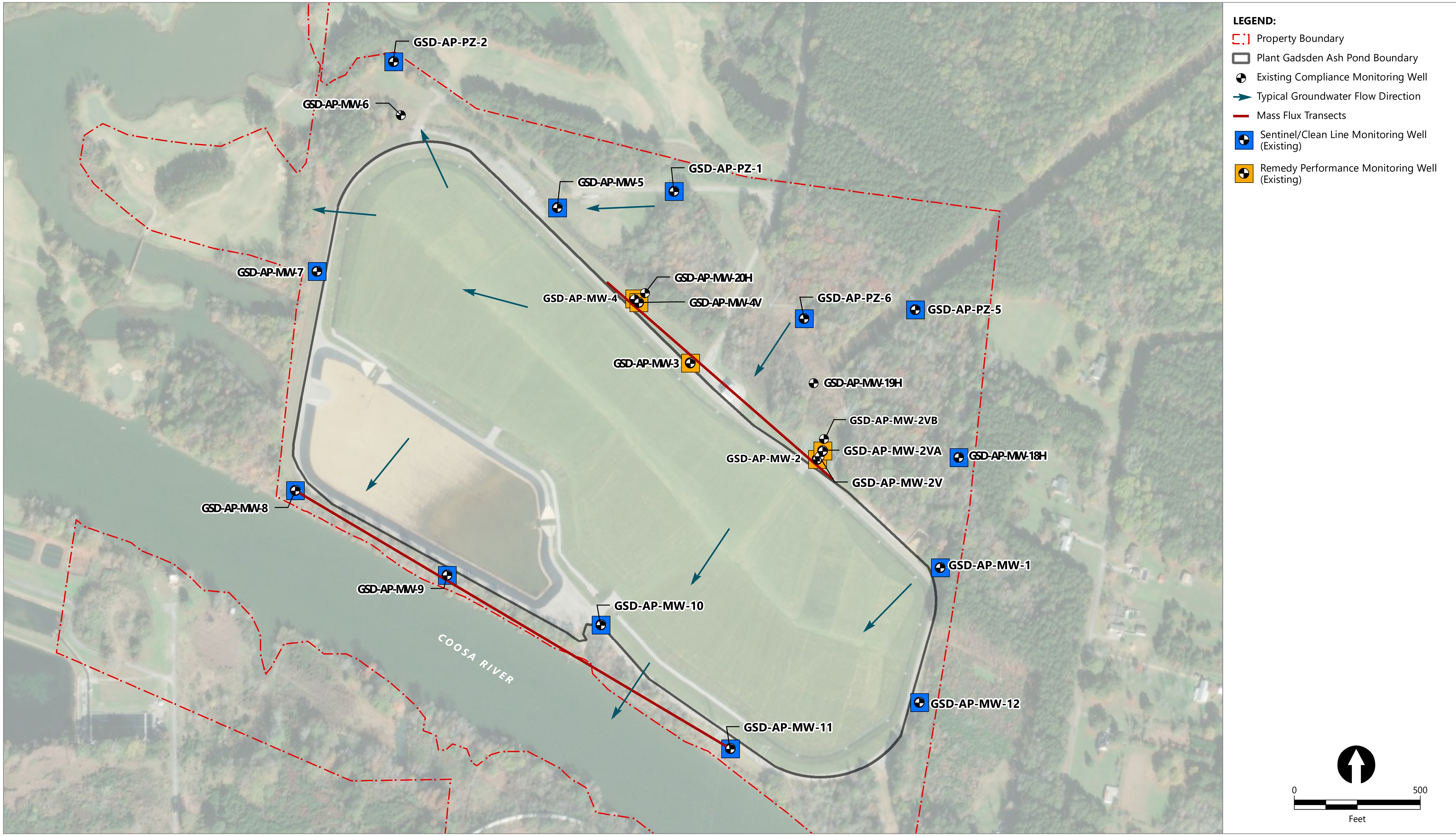


NOTE: Proposed injection and monitoring well locations are to be considered conceptual. Locations to be refined during design phase.
HORIZONTAL DATUM: Alabama State Plane East Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: NAVD88

Publish Date: 2021/10/27 9:31 AM | User: hmerrick
Filepath: K:\Projects\1114-Southern Company\Gadsden\1114-RP-001 (Gadsden Inj Well Sections).dwg Figure 10

ANCHOR QEA

Figure 10
Injection and Monitoring (Cross Section): GSD-AP-MW-4



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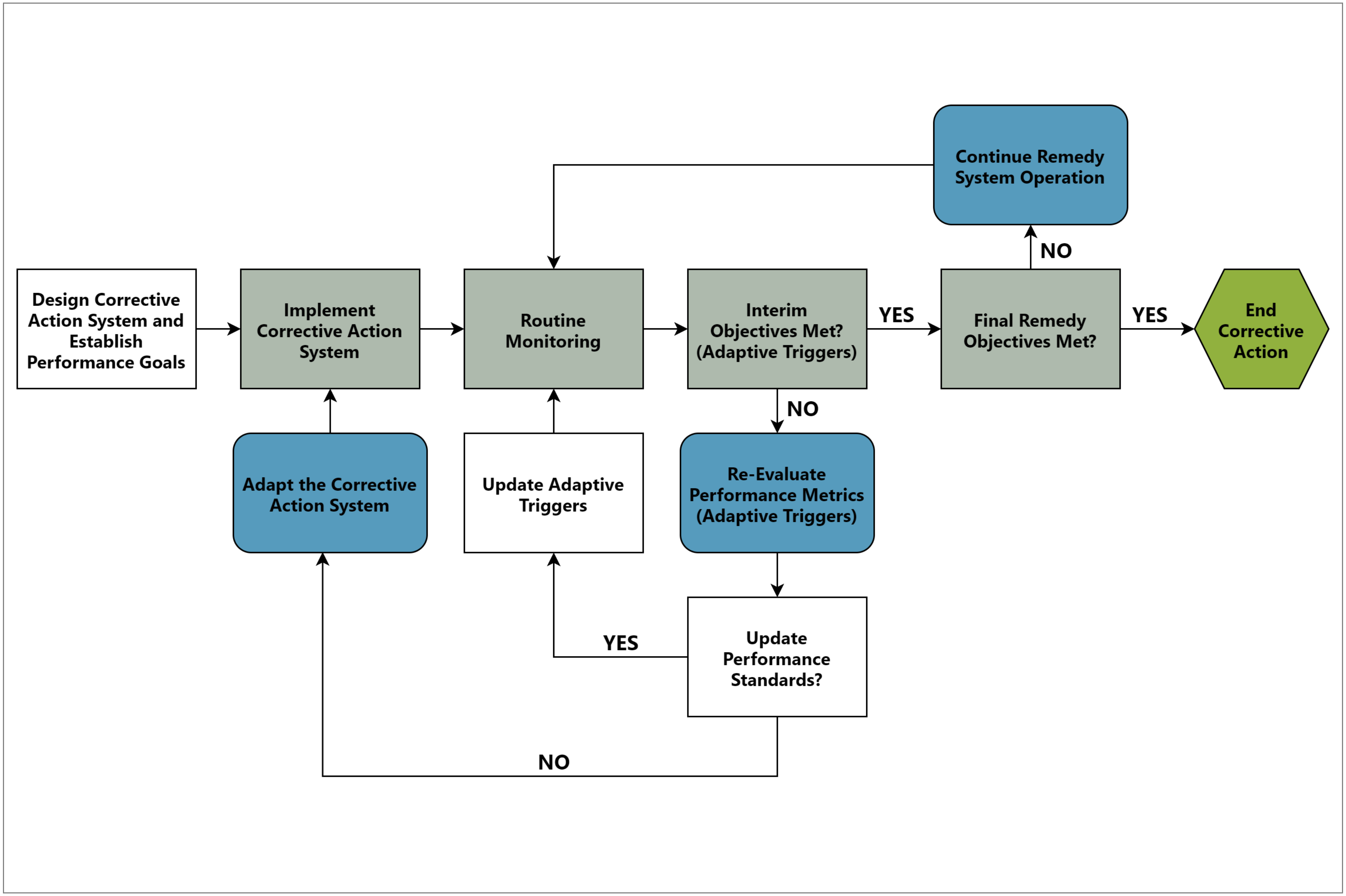
ANCHOR QEA

Figure 11
Conceptual Corrective Action Monitoring Plan
Groundwater Remedy Selection Report
Plant Gadsden



ANCHOR QEA

Figure 12
Adaptive Site Management Framework
Groundwater Remedy Selection Report
Plant Gadsden

Before Class V UIC Permit Submittal	M1	M2	M3	M4	M5	M6	M7	M8	M9
Collect soil and groundwater samples for treatability studies									
Conduct batch studies for reagents and doses									
Conduct column studies for effectiveness									
Prepare Class V UIC Permit									

After Class V UIC Permit Approval	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	Y2
Design field implementation of injection treatment													
Refine delineation in the field													
Field implementation (well installation and injections)													
Collect and analyze remedial effectiveness monitoring data													

Notes:
M: month
UIC: Underground Injection Control
Y: year

Filepath: \\Athena\Mobile\Projects\Southern Company\Alabama Power ACMs - PRIVILEGED & CONFIDENTIAL\Remedy Selection Reports\Gadsden\Figures\Figure 13 - Injection Schedule.docx

ANCHOR QEA

Figure 13
Anticipated Injection Treatment Schedule
Groundwater Remedy Selection Report
Plant Gadsden

Appendix A
Certificate of Authorization

State of Alabama

Board of Licensure for Professional Engineers and Land Surveyors

This is to certify that

ANCHOR QEA LLC

Having given satisfactory evidence of the necessary qualifications required by law has been duly certificated and is hereby issued Certificate of Authorization

CA- 5073 -E

authorizing the firm to provide or offer to provide

Engineering

services in the State of Alabama through individual licensed professional licensees as agents, employees, officers or partners.

This certificate requires the firm to operate in the State of Alabama as

ANCHOR QEA LLC

This certificate will lapse January 31, 2022 unless renewed.

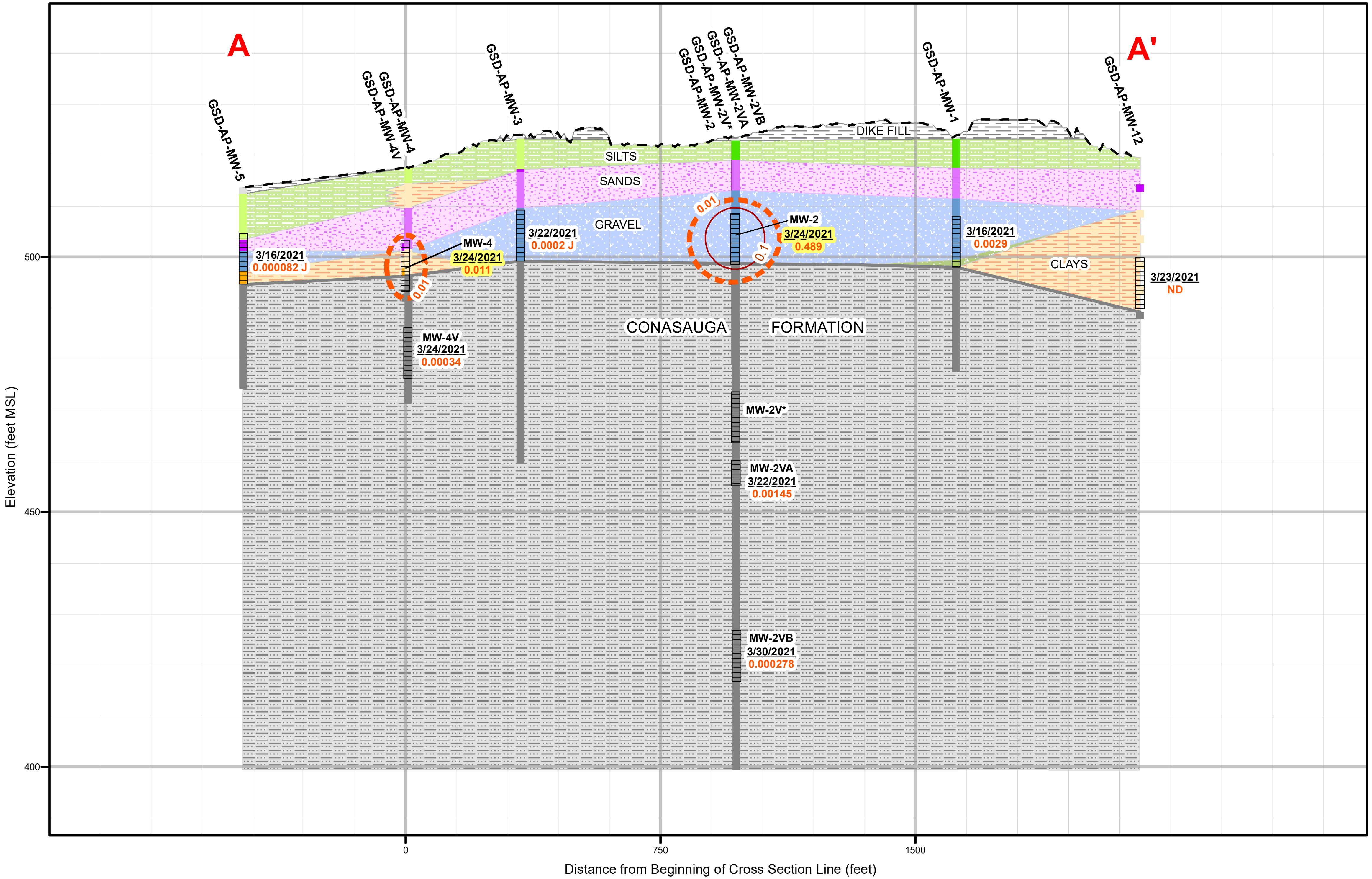
In Testimony whereof, witness the signature of the Executive Director under seal of the Board on November 02, 2020

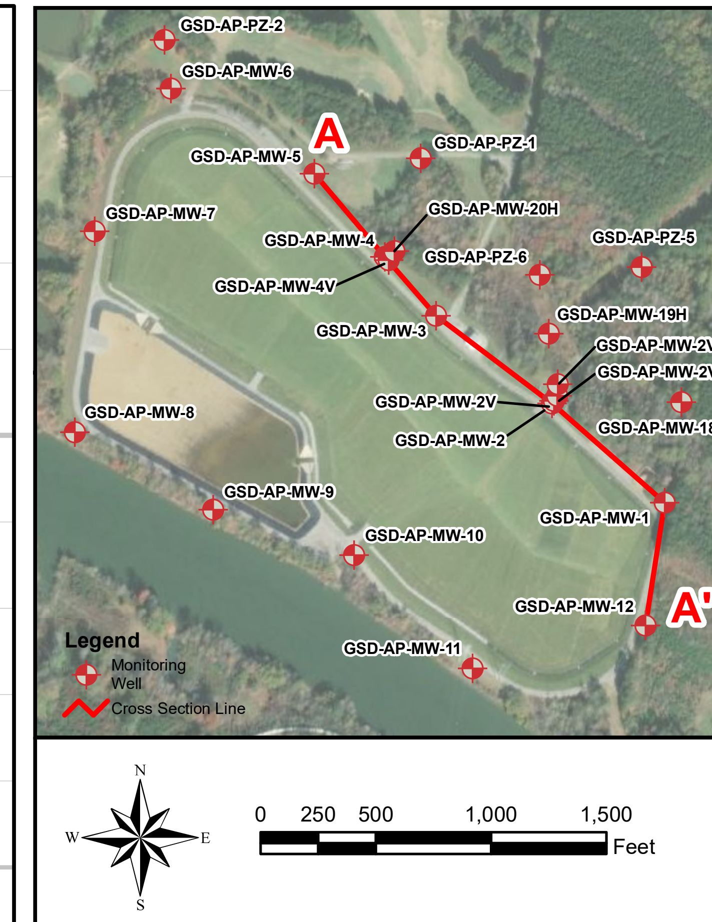
William R. Huett

Executive Director

RECEIPT NO.
20201102000023800

Appendix B
Potentiometric Surface Maps





Notes:
1. Stratagraphic layers were correlated using boring data.
2. Elevation data are reported using feet above Mean Sea Level (MSL).
3. Vertical exaggeration is 15x.
4. ND indicates concentration not detected above laboratory method detection limit.
5. Values highlighted in yellow indicate concentration above the GWPS of 0.01 for Arsenic.
6. *GSD-AP-MW-2V is utilized for water levels only and was not sampled.
7. J indicates a laboratory estimated concentration between the analytical method detection limit and the laboratory method detection limit.

Legend

- Approximate Arsenic Groundwater Protection Standard Contour (0.01 mg/L)
- Arsenic Isoconcentration Contour (mg/L)
- Screen Interval
- Ground Surface Elevation
- Unit Boundary
- 0.01 As Concentration (mg/L)

Borehole Descriptions

- Topsoil/Fill
- Lean and Sandy Lean Clay
- Silty Clay
- Silt
- Sandy Silt
- Silty Sand
- Well-graded Sand
- Poorly-graded Sands
- Clay, Sand, and Gravel Mix
- Well-graded Gravel
- Mudstone/Shale

Geologic Units

- Dike Fill
- Clays
- Silts
- Sands
- Gravel
- Clay, Sand and Gravel
- Mudstone/Shale

HORIZONTAL SCALE	1:4,000
DATE	7/22/2021
DRAWN BY	KWR
CHECKED BY	GFB

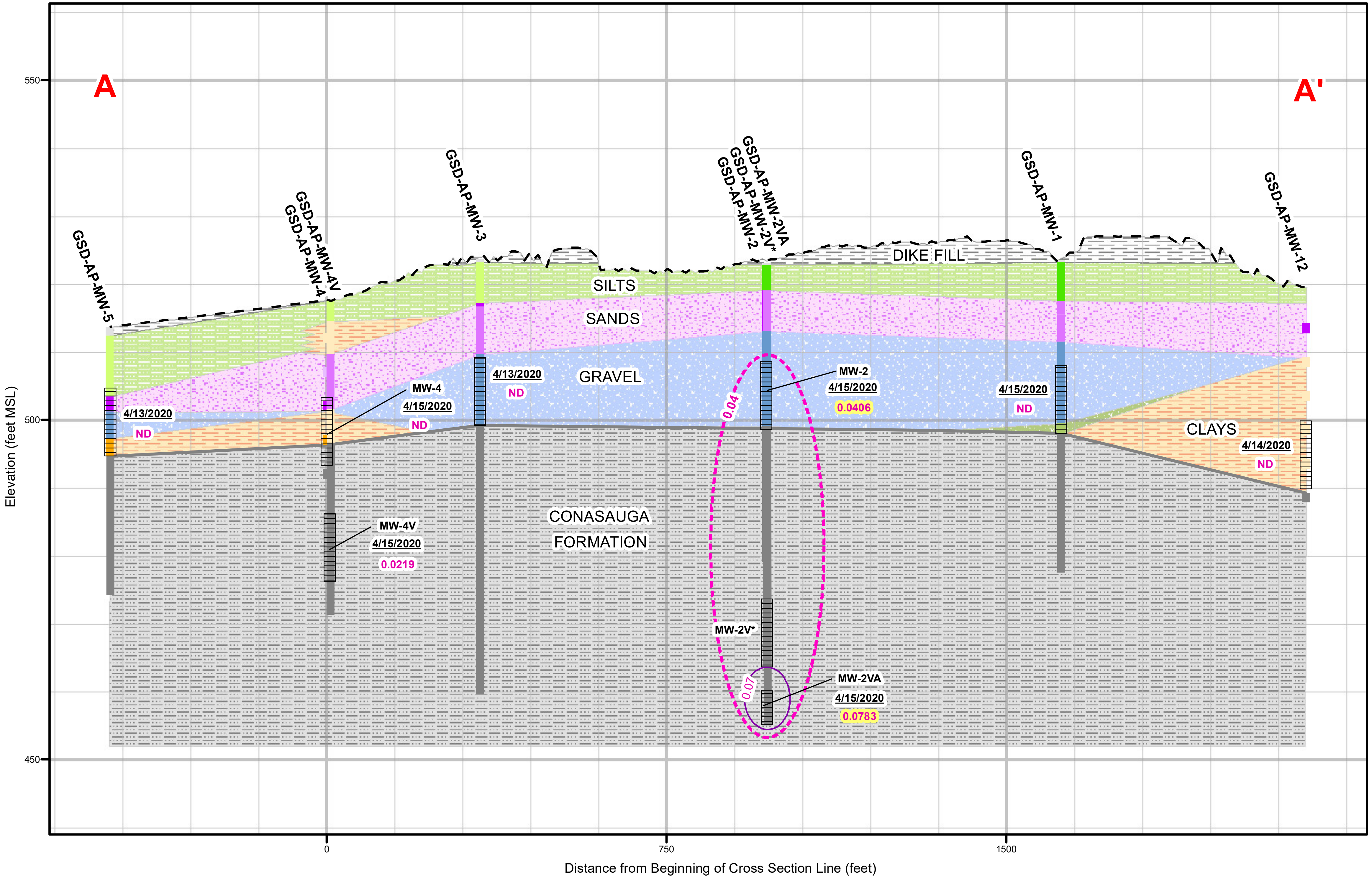
DRAWING TITLE

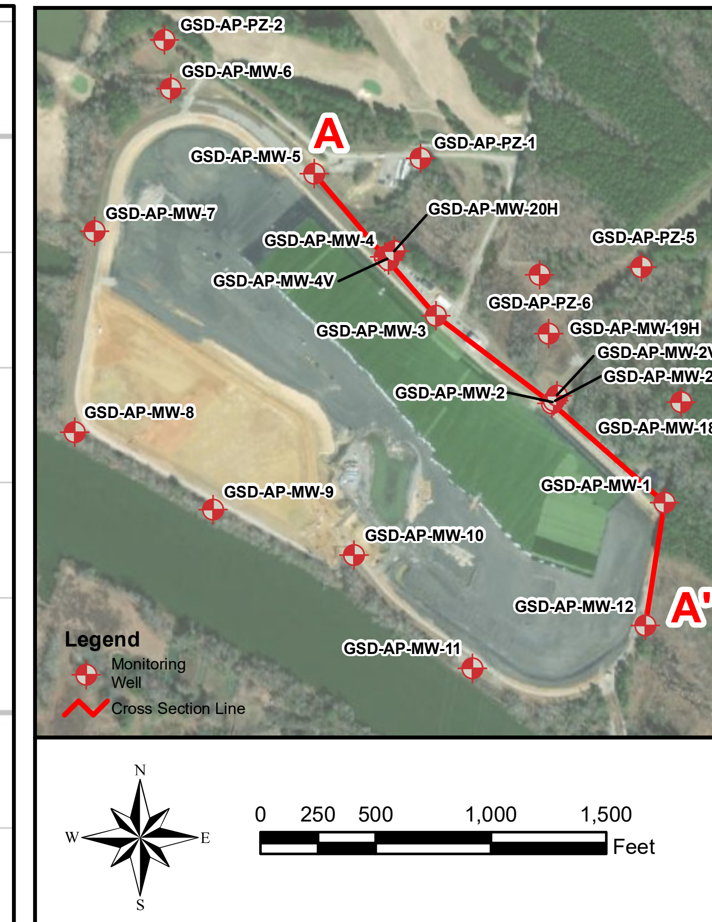
ARSENIC CONCENTRATIONS ALONG GEOLOGIC PROFILE A - A' (MARCH 2021) PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 9B

Southern Company





Notes:
1. Stratagraphic layers were correlated using boring data.
2. Elevation data are reported using feet above Mean Sea Level (MSL).
3. Vertical exaggeration is 15x.
4. ND indicates concentration not detected above laboratory method detection limit.
5. Values highlighted in yellow indicate concentration above the GWPS of 0.04 for Lithium.
6. *GSD-AP-MW-2V is utilized for water levels only and was not sampled.
7. J indicates a laboratory estimated concentration between the analytical method detection limit and the laboratory method detection limit.

Legend

- Lithium Isoconcentration Contour (mg/L)
- Approximate Lithium Groundwater Protection Standard Contour (0.04 mg/L)
- Screen Interval
- Ground Surface Elevation
- Unit Boundary

Borehole Descriptions

- Topsoil/Fill
- Lean and Sandy Lean Clay
- Silty Clay
- Silt
- Sandy Silt
- Silty Sand
- Well-graded Sand
- Poorly-graded Sands
- Clay, Sand, and Gravel Mix
- Well-graded Gravel
- Mudstone/Shale

Geologic Units

- Dike Fill
- Clays
- Silts
- Sands
- Gravel
- Clay, Sand and Gravel
- Mudstone/Shale

0.0219 Li Concentration (mg/L)

HORIZONTAL SCALE	1:3,000
DATE	11/10/2020
DRAWN BY	KWR
CHECKED BY	GFB

DRAWING TITLE

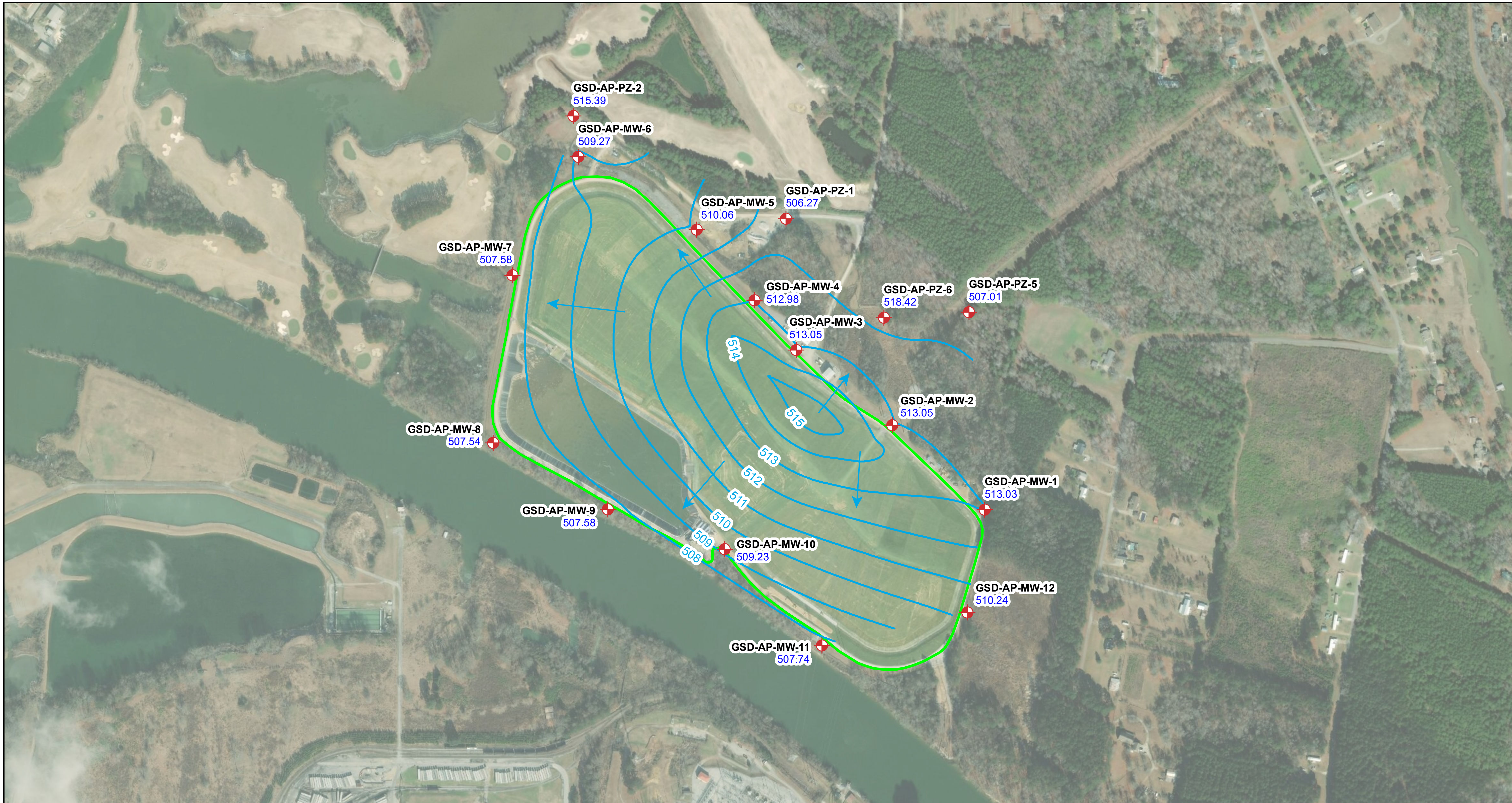
LITHIUM CONCENTRATIONS ALONG GEOLOGIC PROFILE A - A' (APRIL 2020) PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 6A

Southern Company

Appendix C
Concentrations Along Geologic Cross Sections



Legend

Monitoring Well — GN-AP-MW-1 Well ID; 513.03 Groundwater Elevation

Potentiometric Surface Contour (ft NAVD88)

Approximate Groundwater Flow Direction

Ash Pond Boundary

N

0 500 1,000 2,000 Feet

NOTE: NAVD88 indicates North American Vertical Datum of 1988.

SCALE	1:6000
DATE	7/25/2019
DRAWN BY	KWR
CHECKED BY	GBD

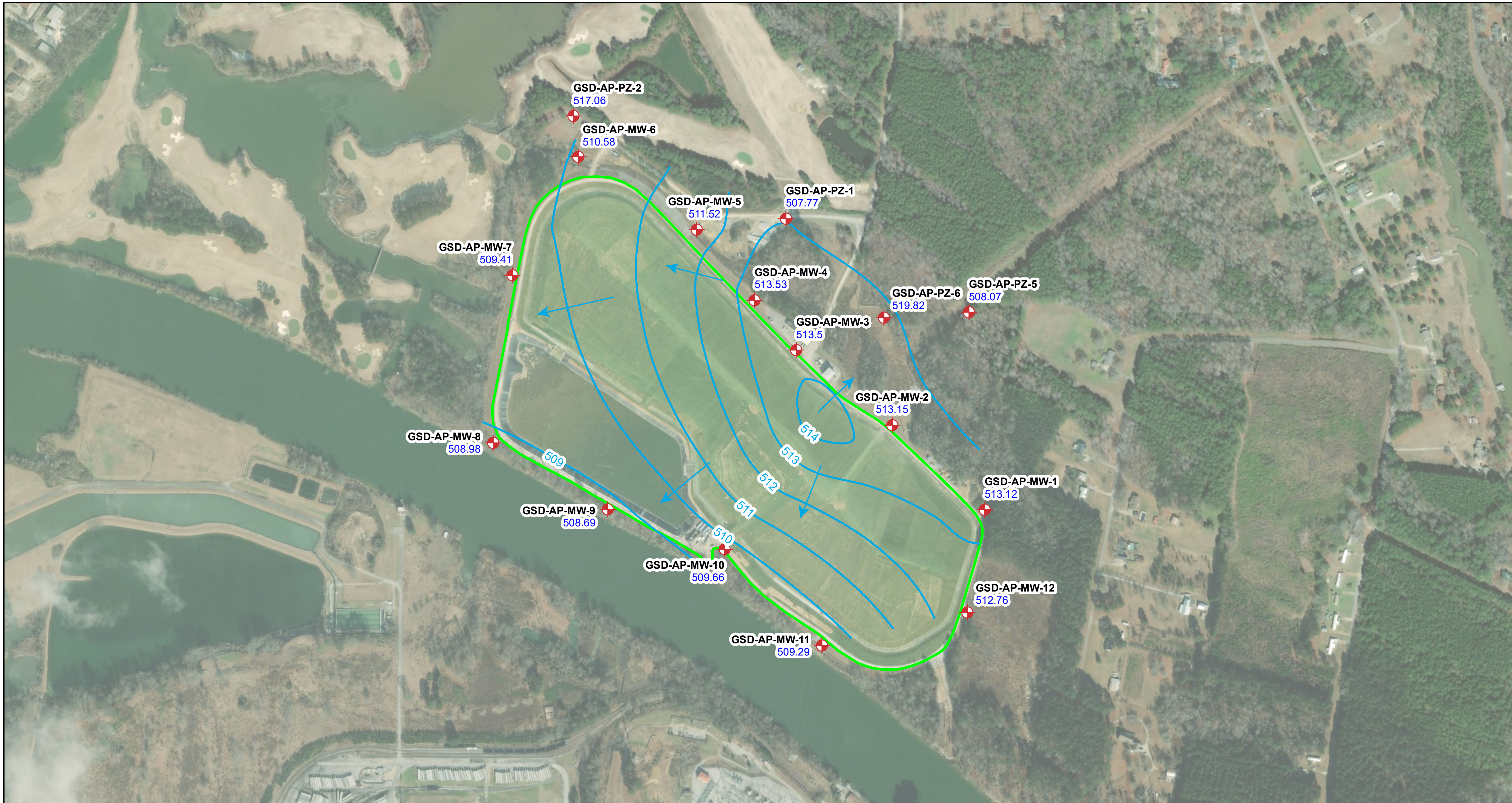
DRAWING TITLE

POTENTIOMETRIC SURFACE CONTOUR MAP
JULY 19, 2018
PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 4

Southern Company



Legend

Monitoring Well — GN-AP-MW-1 Well ID; 513.12 Groundwater Elevation

Potentiometric Surface Contour (ft NAVD88)

Approximate Groundwater Flow Direction

Ash Pond Boundary

N

0 500 1,000 2,000 Feet

NOTE: NAVD88 indicates North American Vertical Datum of 1988.

SCALE	1:6000
DATE	7/25/2019
DRAWN BY	KWR
CHECKED BY	GBD

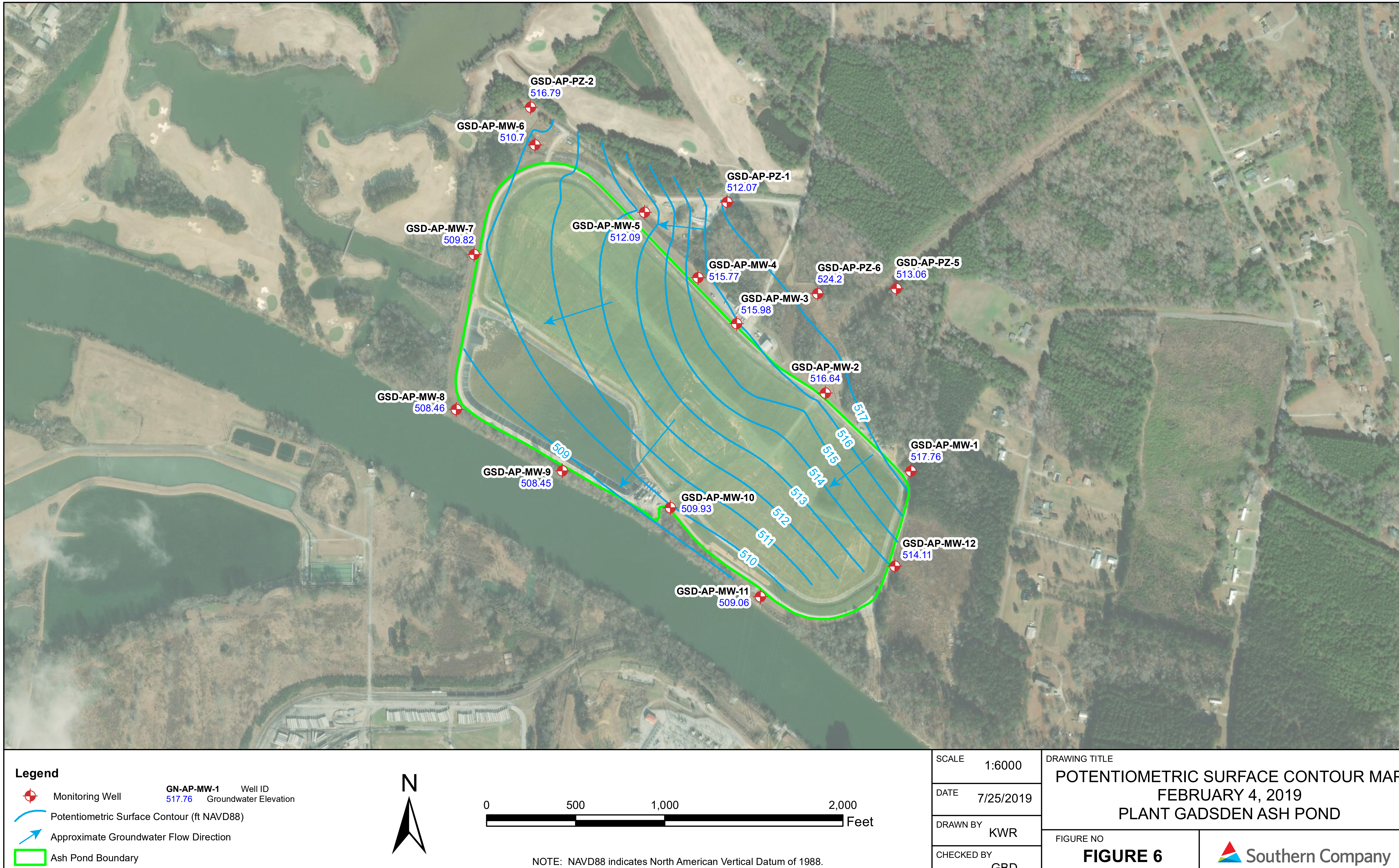
DRAWING TITLE

POTENTIOMETRIC SURFACE CONTOUR MAP
DECEMBER 3, 2018
PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 5

Southern Company



NOTE: NAVD88 indicates North American Vertical Datum of 1988.

SCALE	1:6000
DATE	7/25/2019
DRAWN BY	KWR
CHECKED BY	GBD

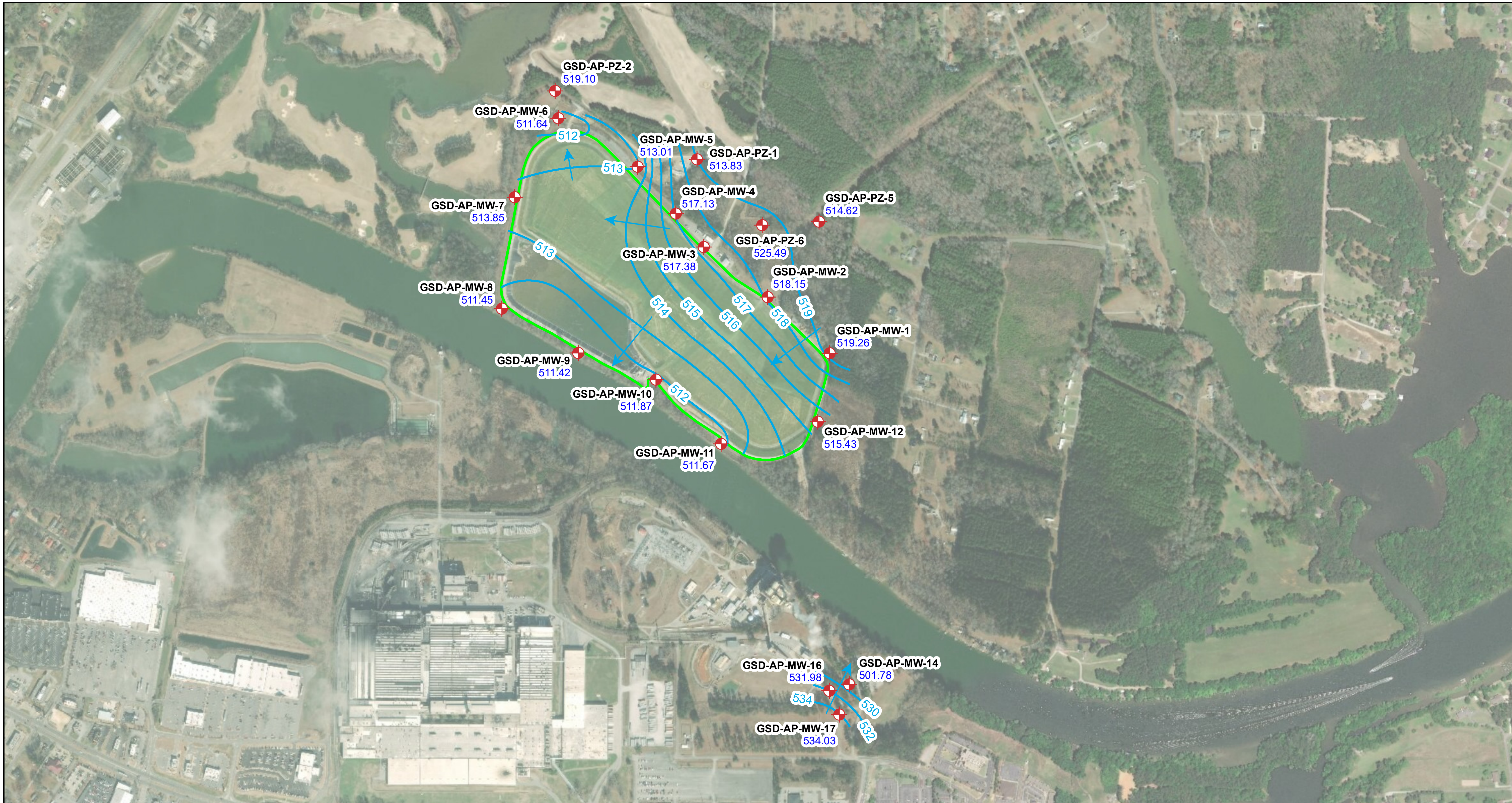
DRAWING TITLE

POTENTIOMETRIC SURFACE CONTOUR MAP
FEBRUARY 4, 2019
PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 6

Southern Company



Legend

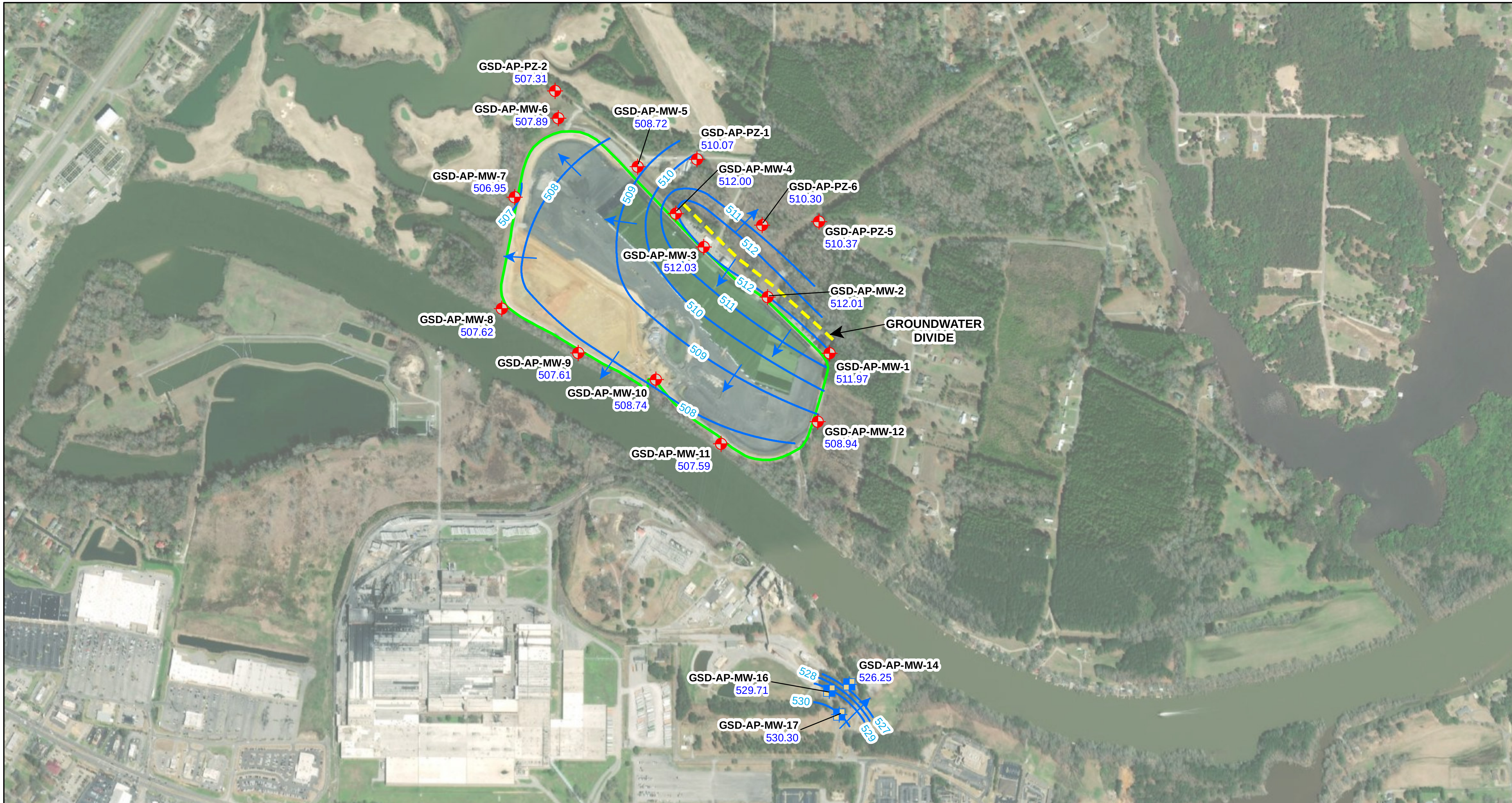
Monitoring Well	GN-AP-MW-1	Well ID
	519.26	Groundwater Elevation
Potentiometric Surface Contour (ft NAVD88)		
Approximate Groundwater Flow Direction		
Ash Pond Boundary		

N

0 500 1,000 2,000 3,000 Feet

NOTE: NAVD88 indicates North American Vertical Datum of 1988.

SCALE 1:9000	DRAWING TITLE POTENTIOMETRIC SURFACE CONTOUR MAP FEBRUARY 25, 2019 PLANT GADSDEN ASH POND	
DATE 7/26/2019		
DRAWN BY KWR	FIGURE NO **FIGURE 7**	Southern Company
CHECKED BY GBD		



Legend

Downgradient Monitoring Well

Upgradient Monitoring Well

GN-AP-MW-1 Well ID

511.97 Groundwater Elevation

Potentiometric Surface Contour (ft NAVD88)

Approximate Groundwater Flow Direction

Ash Pond Boundary

N

0 500 1,000 2,000 3,000 Feet

NOTE: NAVD88 indicates North American Vertical Datum of 1988.

SCALE	1:9000
DATE	7/20/2020
DRAWN BY	KWR
CHECKED BY	GBD

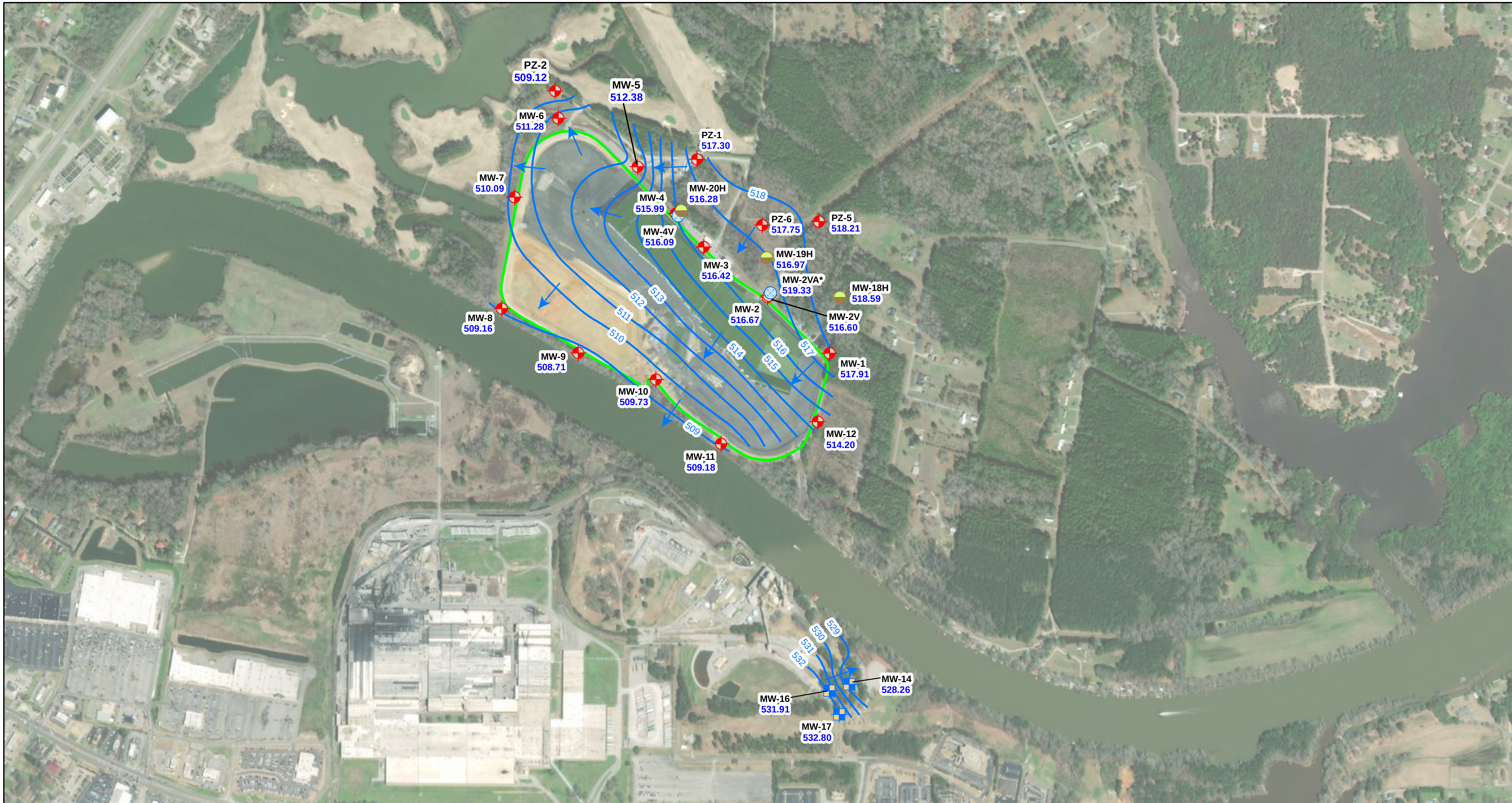
DRAWING TITLE

POTENTIOMETRIC SURFACE CONTOUR MAP
AUGUST 19, 2019
PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 6A

Southern Company



Legend

- Downgradient Monitoring Well
- Upgradient Monitoring Well
- Horizontal Delineation Well
- Vertical Delineation Well
- Piezometer
- Potentiometric Surface Contour (ft NAVD88)
- Approximate Groundwater Flow Direction
- Ash Pond Boundary

MW-1 Well ID
517.91 Groundwater Elevation

N

0 500 1,000 2,000 3,000 Feet

NOTES:
1. ft NAVD88 indicates feet above North American Vertical Datum of 1988.
2. Abbreviated well and piezometer designations are shown for readability. Formal well designations are preceded by "GSD-AP-" as shown on the Monitoring Well Location Map.
3. *Vertical delineation well MW-2VA was excluded from potentiometric surface calculation because it appears to be screened in a separate hydrogeologic unit.

SCALE	1:9000
DATE	11/10/2020
DRAWN BY	KAR
TECH REVIEW	KWR
CHECKED BY	GBD

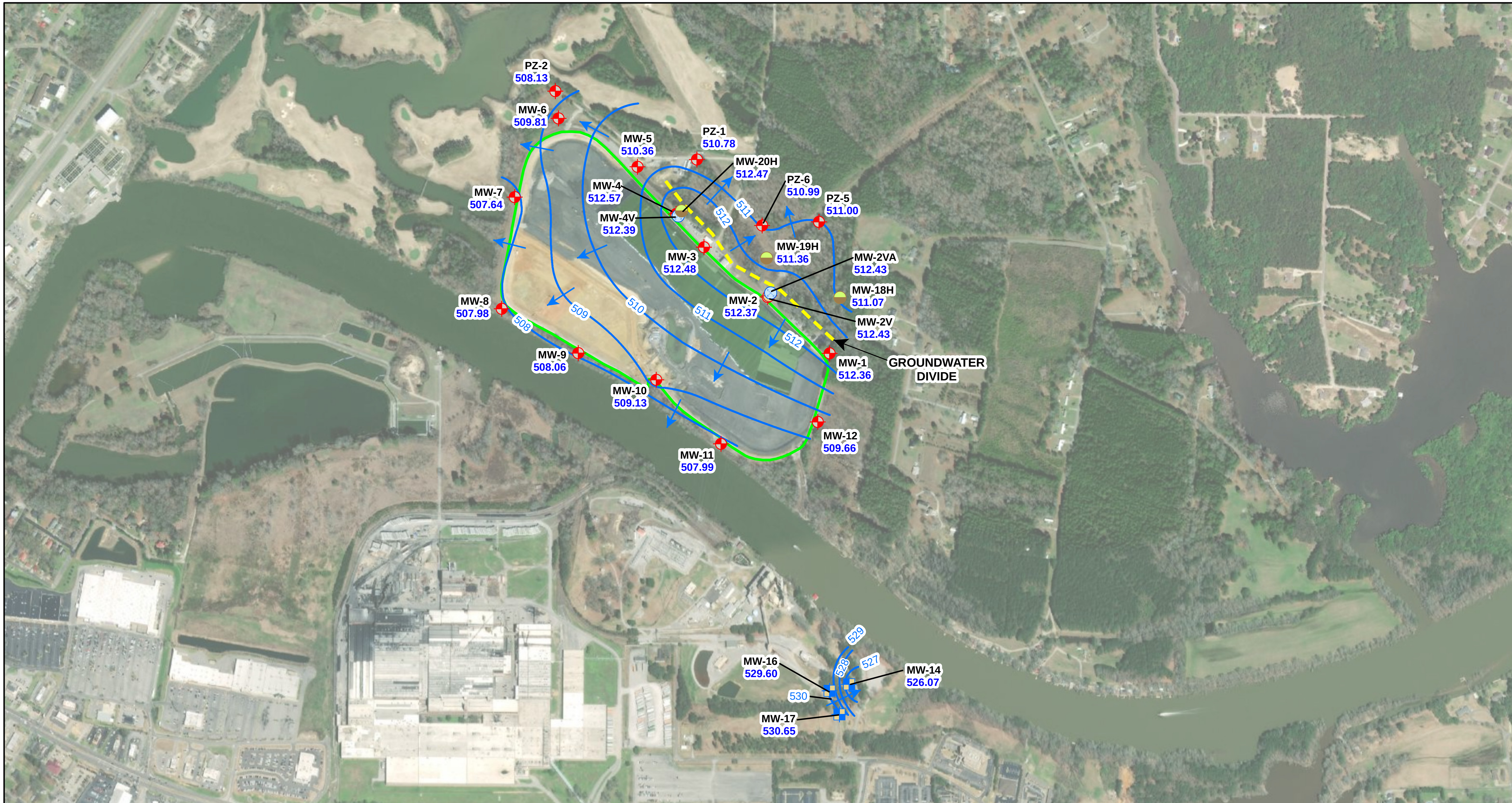
DRAWING TITLE

POTENTIOMETRIC SURFACE CONTOUR MAP
APRIL 13, 2020
PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 6B

Southern Company



Legend

- Downgradient Monitoring Well
- Upgradient Monitoring Well
- Horizontal Delineation Well
- Vertical Delineation Well
- Piezometer
- Potentiometric Surface Contour (ft NAVD88)
- Approximate Groundwater Flow Direction
- Ash Pond Boundary
- Groundwater Divide
- **MW-1** Well ID
- 512.36 Groundwater Elevation

N

0 500 1,000 2,000 3,000 Feet

NOTES:
1. ft NAVD88 indicates feet above North American Vertical Datum of 1988.
2. Abbreviated well and piezometer designations are shown for readability. Formal well designations are preceded by "GSD-AP-" as shown on the Monitoring Well Location Map.

SCALE	1:9000
DATE	11/24/2020
DRAWN BY	KWR
TECH REVIEW	KAR
CHECKED BY	GBD

DRAWING TITLE

POTENTIOMETRIC SURFACE CONTOUR MAP
AUGUST 24, 2020
PLANT GADSDEN ASH POND

FIGURE NO

FIGURE 6C

Southern Company

Appendix D
Monitored Natural Attenuation Demonstration

October 2021
Plant Gadsden

Monitored Natural Attenuation Demonstration

Prepared for Alabama Power Company

October 2021
Plant Gadsden

Monitored Natural Attenuation Demonstration

Prepared for
Alabama Power Company
600 18th Street North
Birmingham, Alabama 35203

Prepared by
Anchor QEA, LLC
9797 Timber Circle, Suite B
Daphne, Alabama 36527

Project Number: 201114-01.05
\\Athena\Mobile\Projects\Southern Company\Alabama Power ACMs - PRIVILEGED & CONFIDENTIAL\MNA Demonstration Reports\Gadsden\Text\Gadsden MNA Demonstration Report.docx

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APPENDIX

ABBREVIATIONS

µg/L	microgram per liter
ADEM	Alabama Department of Environmental Management
APC	Alabama Power Company
CCR	coal combustion residuals
CEC	cation exchange capacity
cm	centimeter
COI	constituent of interest
EGL	Anchor QEA Environmental Geochemistry Laboratory
GWPS	groundwater protection standard
meq/kg	milliequivalent per kilogram
MNA	monitored natural attenuation
Plant Gadsden	Gadsden Electric Generating Plant
PV	pore volume
Site	Plant Gadsden Ash Pond
SSE	selective sequential extraction
SSL	statistically significant level
USEPA	U.S. Environmental Protection Agency
XRD	X-ray diffraction
XRF	X-ray fluorescence

Executive Summary

Extensive geochemical and related studies demonstrate that monitored natural attenuation (MNA) is a viable corrective action for groundwater impacts associated with the Gadsden Electric Generating Plant Ash Pond (Site). The preponderance of evidence indicates that conditions at the Site meet the U.S. Environmental Protection Agency's evaluation criteria for the use of MNA; specifically, area of impacts stable or shrinking, identified mechanisms for attenuation, stability of the attenuating mechanisms, sufficient aquifer capacity for attenuation, and time to achieve groundwater protection standards (GWPSs) are reasonable compared to other corrective action alternatives. However, MNA is one component of the Site's corrective action remedy. As noted in the *Groundwater Remedy Selection Report*, the following corrective measures were selected for the Site: source control to include dewatering, consolidation and capping of the Site (completed), geochemical manipulation via injections in the two areas with constituents of interest (COIs) to remove them from groundwater and immobilize them in situ, and MNA over the entire Site.

Investigations performed to support the use of MNA at the Site included preparation of concentration versus time and concentration versus distance graphs for COIs in groundwater; groundwater, well solids (precipitates), and soil sampling; laboratory analyses of well solids (precipitate) samples for bulk chemistry (X-ray fluorescence), mineralogy (X-ray diffraction), and cation exchange capacity; geochemical modeling; selective sequential extraction (SSE) to determine associations of COIs with attenuating solids; and column studies to assess the aquifer (soil) capacity for attenuation.

The trends observed in concentration versus time and concentration versus distance graphs provide evidence that natural attenuation is occurring at the Site. Concentration versus time graphs indicate that arsenic and lithium concentrations are stable or are decreasing with time in the areas of interest. Also, concentration versus distance graphs along downgradient transects indicate that arsenic and lithium are decreasing with distance from the areas with COIs.

Based on the geochemical investigations, multiple lines of evidence support multiple attenuating mechanisms, depending upon the COI. The major attenuating mechanisms include sorption on and/or coprecipitation with iron and manganese oxides (for arsenic and lithium), ion exchange on clays (for lithium), and precipitation of barium arsenate (for arsenic). Both COIs are also subject to physical attenuation mechanisms such as dispersion and flushing, which will contribute to decreased concentrations with time and distance from the areas with COIs.

Column studies were performed to assess the capacity of the aquifer media (soil) to take up COIs. Arsenic and lithium are attenuated by aquifer media. Arsenic in column effluent remained below 25% of the influent concentrations (i.e., 75% to more than 95% removal). Though not as strongly attenuated by aquifer media, lithium removal in the columns was more variable (30% to 90% removal in shallower soils and less than 10% removal in deeper soils), likely reflecting differences in soil mineralogy with depth. This attenuation capacity was extrapolated to the entire mass of the aquifer downgradient of the consolidated Site but within the property boundary. The extrapolation showed that the attenuation capacity of the aquifer is many times greater than the mass of arsenic and lithium requiring attenuation.

SSE was performed on samples of aquifer solids (soils) before and after column testing to assess the stability of the attenuated COIs and their host minerals. Most of the mass of arsenic and lithium is bound in the more stable fractions: specifically, the F3 (reducible), F4 (strong acid/oxidizable), and F5 (residual) fractions. Attenuated arsenic and lithium, therefore, are not expected to remobilize back into groundwater.

The slope of trend lines through recent data on concentration versus time graphs and results from reactive transport modeling were used to estimate time to achieve the applicable GWPS. For lithium, estimated time to achieve GWPSs is 13 years or less. Depending on location, estimated time to achieve GWPSs for arsenic ranges from less than 10 years for GSD-AP-MW-4 to approximately 80 years for GSD-AP-MW-2. Though these time frames are reasonable to achieve GWPSs by MNA, Site closure and injection treatments (enhanced attenuation) are expected to reduce the time to achieve GWPSs as compared to MNA alone.

1 Introduction

The Gadsden Electric Generating Plant (Plant Gadsden) Ash Pond (Site), located in Etowah County, Alabama, is owned and operated by Alabama Power Company (APC). As of October 19, 2015, the Site ceased receipt of all coal combustion residuals (CCR) and non-CCR waste streams. Closure and capping of the Site began in 2016 and was substantially completed in 2018. The Alabama Department of Environmental Management (ADEM) approved Site closure in 2020.

APC has been monitoring groundwater at the Site in accordance with the U.S. Environmental Protection Agency (USEPA) CCR Rule 40 Code of Federal Regulations (CFR) § 257.97 and ADEM Administrative Code (Admin. Code) r. 335-13-15-.06 since 2017. Constituents of interest (COIs) for the Site include arsenic and lithium.

USEPA defines monitored natural attenuation (MNA) as the "reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods" (USEPA 1999, 2015). An MNA evaluation consists of the following steps or tiers (USEPA 2015):

1. Demonstrate that the area of impacts (plume) is stable or shrinking.
2. Determine the mechanisms and rates of attenuation.
3. Determine that the capacity of the aquifer is sufficient to attenuate the mass of constituents in groundwater and that the immobilized constituents are stable and will not remobilize.
4. Design a performance monitoring program based on the mechanisms of attenuation and establish contingency remedies (tailored to site-specific conditions) should MNA not perform as expected.

As shown in Table 1, the field and laboratory investigations completed for this evaluation support USEPA's Tiers 1 through 3. Tier 4 is addressed in the accompanying *Groundwater Remedy Selection Report*. A detailed sitewide corrective action monitoring program will be submitted within 90 days of the *Groundwater Remedy Selection Report*.

2 Stability of Areas of Impacts

Existing groundwater data were used to generate concentration versus time and concentration versus distance graphs to determine if attenuation is occurring over time and/or space and to assess natural attenuation occurrence and rates. COIs were plotted on the y-axis. For the concentration versus time plots, the time between sampling events (in days from 2017 through 2021) was plotted on the x-axis. For the concentration versus distance graphs, the distance between the pond boundary and the monitoring well was plotted on the x-axis. Concentration versus distance graphs were made for both COIs along the potential upgradient-downgradient flowpaths[1]. Specifically, concentration versus distance graphs were made for the following wells:

- Groundwater flow direction assumed to be from wells of interest toward the northeast
  - GSD-AP-MW-2 to GSD-AP-PZ-5 (arsenic and lithium)
  - GSD-AP-MW-4 to GSD-AP-PZ-1 (arsenic)
- Groundwater flow direction assumed to be from wells of interest toward the southwest
  - GSD-AP-MW-2 to GSD-AP-MW-11 (arsenic and lithium)
  - GSD-AP-MW-4 to GSD-AP-MW-9 (arsenic)

The trends observed in recent data provide evidence that natural attenuation is occurring at the Site. Recent trends in wells that have statistically significant levels (SSLs) of at least one COI are decreasing with time (except for arsenic in GSD-AP-MW-4, which is stable), which supports USEPA's Tier 1 for MNA. These decreasing trends are expected to continue, since closure activities have likely controlled the source of COIs to groundwater. All available concentration versus time graphs are included in Figure 1. For concentration versus distance, all transects showed COI concentrations decreasing with distance away from the areas with COIs, indicating spatial attenuation (Figure 2).

[1]Groundwater elevation contours between December 2017 and December 2018 displayed a radial pattern of groundwater flow away from the Site. Groundwater flow was interpreted to flow to the north, south, east, and west from the Site. Therefore, wells and piezometers around the periphery of the pond are all classified as downgradient. Between December 2018 and February 2019 (5 to 7 months after closure), the radial groundwater flow pattern diminished and became a northeast-to-southwest groundwater flow pattern toward the Coosa River.

3 Groundwater Sampling and Analysis

Groundwater samples were collected by Anchor QEA, LLC, on August 3 through August 7, 2020. The samples were submitted to the APC General Test Laboratory for chemical analysis to evaluate MNA and enable groundwater geochemical modeling. This groundwater data could also be used to support geochemically based corrective action such as geochemical manipulation (injections). Groundwater samples were collected from monitoring wells as listed in Table 2. The samples were analyzed for major cations and anions and parameters influencing the chemical behavior of the COIs. The analyzed constituents and associated laboratory analytical methods are summarized in Table 3.

Groundwater samples were collected from monitoring wells included in Table 2 using the dedicated pump installed in each well. Wells were purged at a low flow rate to minimize drawdown and sampled using low-flow sampling techniques in accordance with 40 CFR § 257.93(a) and ADEM Admin. Code r. 335-13-15-.06(4)(a). Prior to sampling, each monitoring well was purged until field parameters (pH, temperature, specific conductance, dissolved oxygen, and oxidation-reduction potential) stabilized. Turbidity was measured during sampling but was not used as a stabilization criterion.

4 Geochemical Stability and Speciation Calculations

Geochemical equilibrium modeling was performed to determine mineral phases that may be controlling the dissolved concentrations, mobility, and attenuation of arsenic and lithium, as well as the behavior of other species (such as iron, manganese, and aluminum) that influence the behavior of the COIs.

The Geochemist's Workbench software (Bethke and Yeakel 2013) was used to construct Pourbaix (Eh-pH) diagrams for the iron, arsenic, and manganese based on Site groundwater chemistry to assess the geochemical stability of phases potentially controlling COI concentrations under Site conditions (Figures 3 through 5, respectively). Blue fields indicate dissolved/mobile species, and yellow fields indicate solid/attenuated species. Eh-pH data from the August 3-7, 2020, groundwater sampling event are also plotted to determine the most stable species under Site conditions. The Pourbaix stability diagrams indicate the following associations and attenuating mechanisms:

- Site Eh-pH data generally fall along or near the thermodynamic stability boundaries between amorphous iron hydroxide [$Fe(OH)_3(a)$] and dissolved ferrous iron [Fe^{2+}] at pH less than 6, or between amorphous iron hydroxide and siderite [$FeCO_3$] at higher pH. Aquifer Eh-pH conditions are, therefore, controlled by equilibria between iron species (Figure 3). Amorphous iron oxides are strong sorbents for many metals and metalloids including arsenic.
- Site Eh-pH data also plot within the stability field of a barium arsenate mineral phase [$Ba_3(AsO_4)_2$] at locations where pH is greater than 4.5 (Figure 4). This mineral phase may control dissolved arsenic concentrations in areas where barium concentrations exceed those of arsenic.
- Lithium is often associated with manganese oxides, specifically with the mineral lithiophorite [$(Li,Al)Mn_2O_2(OH)_2$]. The thermodynamic properties of lithiophorite and other lithium-bearing manganese oxides are not well known, and its stability field shown in Figure 5 is approximate. According to the Eh-pH diagram for manganese, Site groundwater conditions appear to be too reducing (lower Eh) for lithiophorite to be stable; according to Figure 5, manganese oxides may not be stable attenuating phases for lithium at the Site.

Geochemical speciation-solubility calculations were also performed using the U.S. Geological Survey computer program PHREEQC (Parkhurst and Appelo 2013) with the WATEQ4F thermodynamic database (augmented with data for lithiophorite [Parc et al. 1989]) to calculate aqueous speciation and determine the saturation state of groundwater samples with respect to possible mineral phases. Saturation index calculations can be used to infer solid phases potentially present in the aquifer. The solubility of these phases may be controlling dissolved concentrations. If a groundwater solution is saturated or supersaturated with respect to a mineral phase, then that phase could be precipitating and attenuating COIs as it precipitates. Saturation indices for groundwater samples collected August 3 through August 7, 2020, are presented in Table 4, and geochemical speciation modeling results indicate the following:

- Groundwater samples with detectable iron are slightly supersaturated and/or close to equilibrium with respect to amorphous iron hydroxide [$Fe(OH)_3(a)$] and iron carbonate (siderite) and supersaturated with respect to the more crystalline iron oxides (goethite, hematite, and magnetite).
- Groundwater at downgradient wells GSD-AP-MW-2, vertical delineation well GSD-AP-MW-2VA, and horizontal delineation well GSD-AP-MW-20H are supersaturated with respect to a barium arsenate mineral phase.
- Groundwater samples with both detectable aluminum and manganese are supersaturated with respect to lithiophorite (lithium aluminum manganese oxide), suggesting lithiophorite as a potential attenuating phase for lithium at the Site. However, groundwater samples in all wells are undersaturated with respect to manganese oxides and are slightly supersaturated and/or close to equilibrium with respect to rhodochrosite [$MnCO_3$], indicating that redox conditions are generally more reducing than required to stabilize manganese oxides.

5 Solids Sampling and Analysis

Precipitation and coprecipitation may be major mechanisms for natural attenuation. Soil and aquifer media can also sorb COIs, and their geochemistry can indicate if natural attenuation is occurring or has the potential to occur. If well solids (precipitates) are forming and incorporating COIs, then natural attenuation is occurring. Similarly, if well solids (precipitates) are forming and incorporating COIs, this also suggests that attenuation capacity of these mechanisms can be enhanced under existing Site conditions by geochemical manipulation (i.e., injections).

5.1 Sample Collection

To evaluate these mechanisms (precipitation and coprecipitation), solid particles were collected from the bottom of select monitoring wells and analyzed (summarized in Table 2). The solids may be well solids (precipitates) forming in the aquifer or part of the mineralogy of the aquifer that has migrated into the well through the well screen and deposited within the well. Regardless, depending upon their chemistry and mineralogy, the solids may provide evidence for COI attenuation.

Well solids (precipitate) samples were collected as follows:

- Well solids (precipitates) were pumped from the bottom of the well via polyethylene tubing and the applicable pump.
- Groundwater, which was carrying well solids (precipitates), was pumped through an inline filter holder and stand (for example, those manufactured by Geotech Environmental Equipment, Inc.) with a 0.45-micron filter membrane until the filter clogged or the water ran clear. Up to five filters containing well solids (precipitates) were processed at each well (with the objective to collect as much solid material as possible from the bottom of each well).
- All filters from each well were placed in a single plastic petri dish, and the petri dish lid was secured with duct tape.
- Each wrapped petri dish was placed in a Mylar bag with oxygen-absorbent packets.
- The Mylar bags were sealed with no headspace and placed in a secured iced cooler.
- Samples were stored on ice and shipped to the Anchor QEA Environmental Geochemistry Laboratory (EGL) in Portland, Oregon, for analysis.

Aquifer solids (soil) samples were also collected from borings and analyzed to characterize soil directly and provide material for laboratory column experiments to determine capacity, rates, and stability of MNA. Soil samples were collected on March 3, 2021, from the GSD-AP-MW-2VB boring during an additional vertical delineation well installation (Figure 6). Composite soil samples were collected from 11.5 to 13 feet, 13 to 14.5 feet, 14.5 to 16 feet, 16 to 17.5 feet, 17.5 to 19 feet, 19 to 20.5 feet, and 20.5 to 21 feet below ground surface from the GSD-AP-MW-2VB boring. Photographs of representative soil samples are shown in Figure 7. Samples were selected in the field, packaged to preserve field redox conditions (airtight containers packed in Mylar bags with oxygen-scavenging packets), and shipped on ice to the EGL for column study experiments.

5.2 Sample Analysis

Upon arrival at the EGL, well solids (precipitate) and aquifer solids (soil) samples were inspected and checked against the chain of custody. Samples were then stored under refrigeration until processing. To maintain in situ geochemical conditions, well solids (precipitates) were removed from the filters under a nitrogen atmosphere in an aerobic glove box for analysis and geochemical characterization. Solids retained on the sample filters were scraped and rinsed into centrifuge tubes. This mixture was then centrifuged, and the solids were transferred into a pre-weighed glass jar. The solids were then placed into the incubator portion of the glove box at 38°C for 24 to 72 hours until dry.

The well solids (precipitate) and soil samples were analyzed by the following methods:

- X-ray fluorescence (XRF) to determine the chemical composition of the matrix (e.g., iron compounds) and presence of COIs
- X-ray diffraction (XRD) to determine crystalline mineral phases
- Selective sequential extraction (SSE) to determine the association of COIs with attenuating phases and relative strength of attenuation, and provide a sense of permanence
- Cation exchange capacity (CEC) to assess ion exchange as a mechanism for attenuation

Additional detail (including the relevance of each analysis to the MNA evaluation) is included in Table 5.

All samples with sufficient volume were analyzed by XRF to determine their bulk chemical composition. After drying, processed samples were loaded and sealed in plastic sample containers for elemental analysis by XRF. XRF testing was performed by EGL staff using a Niton XL3t GOLDD+ XRF Analyzer rented from Thermo Fisher Scientific. Individual samples were analyzed by XRF using the “Test All Geo” method under the “Mining” profile, which includes most elements heavier than sodium.

Powder XRD analysis was performed on selected well solids (precipitate) and aquifer soil samples to determine mineralogy. Samples were selected based on several factors, including well location; groundwater chemistry; bulk chemical composition data (XRF); and, for well solids (precipitate) samples, available sample mass.

After XRF analysis, samples for SSE analysis were selected using the criteria above and the results of the XRF analysis. SSE targets a series of operationally defined mineral fractions. In SSE, samples are leached with increasingly aggressive solutions to determine the chemical associations. Generally, each successive step represents stronger attenuation and greater permanence than the previous step. The fractions, from most to least environmentally available, are as follows:

- F1: Water soluble
- F2: Exchangeable (e.g., clay minerals)
- F3: Reducible (e.g., poorly crystalline metal oxides such as iron oxides)
- F4: Strong acid/oxidizable (e.g., crystalline oxide and crystalline sulfide minerals)
- F5: Residual (e.g., silicate phases)

The F3, F4, and F5 fractions represent relatively stable (permanent) attenuating mechanisms, provided Site geochemical conditions do not change drastically in the future, which is not expected at the Site.

Cation exchange is a common attenuation mechanism for some COIs, such as lithium. After XRF analysis, samples for CEC analysis were selected using the criteria above and the results of the XRF analysis. CEC is determined by displacing exchangeable cations from a sample using ammonium acetate solution, then analyzing the solution for exchangeable cations including aluminum, calcium, lithium, magnesium, potassium, and sodium. CEC is calculated as the sum of exchangeable cations.

Select samples were also submitted for analysis of extractable oxides of aluminum, iron, and manganese and simultaneously extractable COIs (arsenic and lithium) to determine the concentrations of oxide phases and associated COI(s) to document the role of oxides as attenuating phases.

5.3 Well Solids Results

XRF detected arsenic and relatively high concentrations of iron and aluminum, as well as manganese, in well solids (precipitate) samples (Table 6). Arsenic concentrations are positively correlated with iron and manganese (Figures 8 and 9).

XRD analysis identified quartz, feldspars, and carbonates (calcite and/or dolomite) as the major minerals present in well solids (precipitate) samples. Several clay minerals including montmorillonite, bentonite (a sodium montmorillonite), kaolinite, and muscovite/illite were also identified in varying amounts (Table 7). The presence of clay minerals indicates a significant CEC. (Table 7). As described in Section 5.4, the bentonite is likely naturally occurring from the Conasauga Formation, the rock unit that underlies the Site, though the possibility exists that bentonite in the well solids (precipitates) could be an artifact (residual) from well construction.

Select samples were submitted for CEC testing. CEC was variable in the samples, ranging from 64 to 648 milliequivalents per kilogram (meq/kg; Table 8), which indicates moderate to high attenuation capacity. However, exchangeable lithium was not detected in the CEC tests for well solids (precipitate) samples but was detected in CEC tests on aquifer solids samples (soils; Table 9). Therefore, cation exchange is likely an attenuating mechanism for lithium at the Site. Arsenic is an oxyanion (neutral or negatively charged species) and is not analyzed for in the CEC tests.

Figure 10 shows the results of SSE for six well solids (precipitate) samples. Interpretation by COI indicates the following:

- Arsenic: Bound primarily in the F3 (reducible), F4 (strong acid/oxidizable) and F5 (residual) fractions, though some samples also show an association with the F2 (exchangeable) fraction. These distributions are generally consistent with the identification of crystalline iron oxides from the other investigations and, possibly, barium arsenate (predicted by geochemical modeling).
- Lithium: Bound primarily in the F5 (residual) and, to a lesser extent, the F4 (strong acid/oxidizable) fractions. The F5 fraction likely represents lithium naturally present in the soil matric grains. Lithium was below detection limits in the F1, F2, and F3 fractions. The detection limits for the F1 and F2 fractions, however, were elevated because of matrix interference, which required dilution of samples prior to analysis.

Extractable iron, manganese, and aluminum oxides in well solids (precipitate) samples, and simultaneously extractable arsenic and lithium, are presented in Table 10. The well solids are dominated by iron oxides, which are inferred to have formed in place based on groundwater geochemical modeling results (Eh-pH diagrams) that indicate that iron oxides are stable at the Site. Arsenic was detected in the extracts of all the well solids (precipitate) samples, indicating that arsenic is being attenuated by sorption and incorporation in iron oxides.

5.4 Aquifer Solids (Soil) Results

The aquifer solids (soil) analyses are consistent with the well solids (precipitate) analyses. XRF analysis of soil samples show total iron content in the range of 1.1 to 9.3 weight percent, which likely reflects the iron oxide content of the soils that provides substantial attenuating capacity for COIs such as arsenic (Table 11).

The mineralogy of the soil samples (as determined by XRD) consists mostly of quartz, with lesser amounts of feldspar, mica, goethite (an iron oxide), and clay minerals (Table 12). The identification of goethite, a crystalline iron oxide with high capacity for strong sorption of arsenic and metals, is consistent with the XRF bulk chemistry data and confirms the geochemical modeling interpretations. The clay minerals identified include montmorillonite, bentonite, and kaolinite, all of which possess substantial CEC. Since the bentonite is identified in soil samples collected prior to well installation, it is likely naturally occurring in the soil. Bentonite beds are reported in the Conasauga Formation.

CEC of soil samples is variable and covers a similar range to well solids (precipitate) samples (20 to 420 meq/kg), and exchangeable lithium was detected in the CEC analysis (Table 9). Therefore, ion exchange is a viable attenuating mechanism for lithium.

Extractable iron, manganese, and aluminum oxides in aquifer solids, and simultaneously extractable arsenic and lithium, are present (Table 10). The extractable oxides in soil are dominated by iron and aluminum (likely reflecting aluminum oxide layers in clay minerals and weathered feldspars and micas). Concentrations of iron and manganese oxides were higher in the deeper soils, which are likely derived from weathering of iron and manganese-rich bedrock. Arsenic was detected in all the extracts, and lithium was detected in the extracts from two deeper soil samples with the highest extractable manganese oxide concentrations. The associations of COI with extractable oxides support sorption and attenuation of arsenic and lithium by iron and manganese oxides as attenuating mechanisms at the Site.

Analytical (soil) results are included in Appendix A.

6 Mechanisms for Natural Attenuation

To support MNA, the following laboratory analyses of groundwater and well solids (precipitates) and aquifer solids (soils) were performed:

- Groundwater geochemical modeling using PHREEQC
- Analysis of well and aquifer solids samples by XRF, XRD, and CEC to identify attenuating mechanisms for COIs
- Determined association of COIs with attenuating phases, determined relative strength of attenuation mechanisms, and provided a sense of permanence by SSE

As discussed in Section 5, results from groundwater data analysis, geochemical modeling, well solids (precipitate) and aquifer solids (soil) analyses provide multiple lines of evidence for specific attenuation mechanisms for COIs (summarized in Table 13). The major attenuating mechanisms include sorption on and/or coprecipitation with iron and manganese oxides (for arsenic and lithium), cation exchange on clays (for lithium), and precipitation of barium arsenate (for arsenic).

7 Reactive Transport Modeling

Reactive transport modeling was performed to assess the post-closure fate and transport of COIs (arsenic and lithium) along representative groundwater flow paths at the Site. The objective of the modeling was to quantitatively assess the effectiveness of natural attenuation processes to achieve COI concentrations below the applicable groundwater protection standard (GWPS) outside the Site boundaries following Site closure (source control) and, if applicable, to conservatively estimate the rate of migration of COI concentrations exceeding GWPS to support remedy selection and implementation time frames.

Two 1D transects, extending along groundwater flow paths from the boundary of the Site to downgradient surface water features, were modeled using PHREEQC (Figure 6). Due to Site closure, which is now complete, groundwater currently present along these transects will be progressively replaced by upgradient groundwater with COI concentrations less than the GWPS. In addition, COI concentrations will be attenuated along the flow path due to reactions with the aquifer matrix. Specific attenuating mechanisms for the two COIs included in the models are as follows:

- Arsenic: Sorption to iron oxide binding sites in aquifer soil, as well as precipitation of a barium arsenate mineral phase
- Lithium: Cation exchange on clay minerals in aquifer soil

Inclusion of these attenuation mechanisms in the models was based on analysis of trends in groundwater monitoring data, geochemical modeling, and laboratory studies described in Sections 2 through 6, including data on extractable iron and aluminum oxides and CEC of aquifer solids samples collected in the vicinity of model transect 1 (Tables 10 and 9, respectively).

Sorption reactions of COI and other species on iron oxides were modeled using the surface complexation model of Dzombak and Morel (1990). For lithium uptake on clays, the aluminum oxide binding site model presented in Karamalidis and Dzombak (2010) was used. Transect-specific data, including groundwater chemistry, as well as CEC and extractable iron and aluminum oxide concentration data for aquifer solids, were used to define initial groundwater and aquifer matrix geochemistry.

Initial groundwater chemistry along each transect was based on data for samples collected in late August 2020 for which complete chemical analyses (major and minor constituents, including COIs) were available. Initial chemistries along the transects were defined by background[2] groundwater chemistry data from a downgradient well with no SSLs. The chemistry of groundwater entering the upgradient boundary of each model transect was defined by upgradient well data with COIs at SSLs.

[2] "Background" here refers to groundwater chemical composition, but not necessarily hydraulically upgradient, i.e., groundwater that is not impacted by the ash pond.

This groundwater chemistry was assumed to represent groundwater inflow into the transect for a period of time corresponding to the travel time of groundwater beneath the Site. After this time, the inflow groundwater chemistry was switched to a background chemistry based on data from an upgradient well without SSLs to represent post-closure flushing of the aquifer. During closure, groundwater extraction from within the Site likely induced flushing of the aquifer by groundwater with chemistry similar to background composition, which will result in lower COI mass loading to the transects; therefore, the model assumptions, with regards to groundwater chemistry, are considered conservative. The groundwater chemistry data used in the transect models are presented in Table 14. Average CEC and extractable iron and aluminum oxide data (Table 15) for aquifer soil samples collected near GSD-AP-MW-2VB were used to assign soil sorption parameters in the models (concentrations of cation exchange, and iron and aluminum oxide binding sites).

Model simulations were run for a total time of up to 100 years to include the time for groundwater to travel beneath the former ash pond from the upgradient to downgradient boundary and COI concentrations to decrease below GWPS along each model transect. Groundwater velocities were calculated from hydraulic conductivity, hydraulic gradients, and effective porosity data. The average horizontal hydraulic conductivity (12.3 feet per day) and a value of 0.2 for effective porosity were taken from the *Semi-Annual Groundwater Monitoring and Corrective Action Report* (SCS 2021). Hydraulic gradients were calculated from August 2020 groundwater elevation data for wells along transects 1 and 2. Reactive transport models for the two transects, including model results, are described in more detail as follows:

- Transect 1, Arsenic and Lithium at SSLs
  - Transect length = 110 feet; hydraulic gradient = 0.0045; linear groundwater velocity = 0.28 foot per day; length of groundwater flow path beneath ash pond = 1,100 feet; flushing time 10.8 years; total simulation time = 100 years.
  - Transect wells for chemistry: initial background = GSD-AP-MW-11; upgradient (impacted) = GSD-AP-MW-2; upgradient (flushing) = GSD-AP-MW-20H.
  - Arsenic concentrations are attenuated over time along this transect but are predicted to remain above the GWPS along the upgradient portion of the transect for approximately 80 years. The downgradient extent of GWPS exceedances is predicted to slowly expand as the maximum concentration decreases (Figure 11).
  - Lithium concentrations are predicted to be attenuated over time and decrease below the GWPS along this transect within approximately 13 years (Figure 11).
- Transect 2, Arsenic at SSLs
  - Transect length = 135 feet; hydraulic gradient = 0.0023; linear groundwater velocity = 0.14 foot per day; length of groundwater flow path beneath = 1,480 feet; flushing time = 29 years; total simulation time = 58 years.

- Transect wells for chemistry: initial background = GSD-AP-MW-8; upgradient (impacted) = GSD-AP-MW-4; upgradient (flushing) = GSD-AP-MW-20H.
- Arsenic concentrations are attenuated along this transect and predicted to decrease below the GWPS in less than 10 years. (Figure 12).

The reactive transport model results presented here indicate that, since source control measures have likely reduced COI loading to groundwater, natural attenuation processes will play an important role in achieving GWPS. For lithium, model predictions indicate that GWPS could be achieved within 13 years. The time frames for achieving GWPS for arsenic by natural attenuation alone, however, depend on present concentrations and are predicted to range from less than 10 years for impacts associated with GSD-AP-MW-4 to approximately 80 years for impacts associated with GSD-AP-MW-2. The modeling results, however, indicate that natural attenuation is occurring and demonstrate that it can be a component of the final remedy; however, attenuation capacity may be enhanced in the vicinity of GSD-AP-MW-2 (e.g., via injection treatment) to reduce arsenic concentrations and the time frame for achieving GWPS.

8 Column Studies

8.1 Methodology (Setup)

Column tests were performed using Site aquifer media (soil) and impacted groundwater to evaluate effectiveness of removal of COIs under flow conditions and provide a basis for estimating the natural attenuation capacity of the aquifer matrix (part of USEPA's Tier 3).

A groundwater sample was collected on March 24, 2021, from monitoring well GSD-AP-MW-2. Upon receipt, the groundwater sample was submitted to ALS Environmental in Kelso, Washington, for chemical analysis prior to beginning the column testing. Analytical results are summarized in Table 16 and included in Appendix A. Five column tests were prepared with five Site soils (GSD-AP-MW-2VB-11.5-13.0, GSD-AP-MW-2VB-13.5-14.5, GSD-AP-MW-2VB-14.5-16.0, GSD-AP-MW-2VB-16.0-17.5, and GSD-AP-MW-2VB-17.5-19.0). GSD-AP-MW-2 groundwater was pumped through the columns (Table 17). The laboratory column setup is shown in Figure 13, and a detailed schematic is provided in Figure 14.

Column tests were carried out in 4.2-centimeter (cm)-diameter polycarbonate columns with a bed height of 11.0 cm. Site groundwater was pumped in an up-flow direction through the columns at a flow rate of approximately 0.5 milliliters per minute for 22 days using a peristatic pump with a multichannel pump head. Flow rates were regularly checked and adjusted as needed to maintain a constant flow rate. Table 18 provides a summary of the column test operating conditions.

The initial arsenic concentration in GSD-AP-MW-2 groundwater was lower than expected based on historical data (197 micrograms per liter [µg/L] versus recent monitoring results of approximately 700 µg/L). Despite precautions to prevent oxidation, some iron and manganese precipitation was observed in groundwater containers received from the field. The precipitates had likely removed some dissolved arsenic from groundwater during shipping. The initial concentration of lithium (30 µg/L) was slightly lower but similar to recent monitoring data (41 µg/L).

Column influents and effluents were sampled periodically over the duration of the test. The samples were tested for pH at the time of sampling and filtered using 0.45-micron nylon syringe filters and preserved with nitric acid. Flow rates and cumulative flow volumes were also recorded for each column at the time of sampling to calculate the total number of pore volumes (PVs) treated. The column influent and effluent samples were analyzed for dissolved COIs by USEPA method 200.8 (inductively coupled plasma mass spectrometry) at ALS Environmental.

The laboratory column tests were operated at a higher linear velocity (52 cm per day) than the groundwater flow conditions in the vicinity of the Site, which is approximately 2.4 cm per day (SCS 2021). As a result, the hydraulic residence time in the columns was also much shorter than the hydraulic residence time at the Site. The attenuation measured in the columns, therefore, provides a conservative estimate of the attenuation in the field.

8.2 Column Test Results

Column test results for arsenic and lithium are shown in Figures 15 and 16, respectively. Analytical summary reports are included in Appendix A.

Site soils removed arsenic for the duration of the tests (up to approximately 150 PVs), indicating that the soil capacity for arsenic attenuation was not exhausted. Overall, the five soils tested removed 75% to more than 95% of the arsenic loading to the columns (Figure 17), likely reflecting differences in the abundance and reactivity of iron oxides in the soils.

Site soils also removed lithium but were much more variable in their effectiveness of lithium attenuation, with removal efficiencies ranging from less than 10% to 90% (Figure 18). Lithium was more effectively removed by the shallower Site soils (GSD-AP-MW-2VB-11.5-13.0, GSD-AP-MW-2VB-13.5-14.5, and GSD-AP-MW-2VB-14.5-16.0) than the deeper soils (GSD-AP-MW-2VB-16.0-17.5 and GSD-AP-MW-2VB-17.5-19.0). The removal capacity of the deeper soils was exhausted after 12 PVs. The differences in the lithium attenuation capacity of Site soils may be related to the nature and reactivity of iron and manganese oxides. The shallower soils are yellow-orange in color (indicating they are fully oxidized), whereas the deeper soils are gray (indicating they are reduced/less oxidized).

9 Aquifer Capacity for Attenuation

Geospatial methods were used to calculate the estimated saturated volume of the aquifer, and the estimated mass of COIs in the aquifer. ArcGIS software (Esri 2021a) was used to perform all geospatial operations. Saturated aquifer thickness data (interpreted from boring and well construction logs), groundwater chemistry data (collected from Site monitoring wells), and previously reported Site porosity values (SCS 2021) were used to create interpolated (Thiessens) saturated aquifer thickness and COI concentration polygons for the entire Site (Esri 2021b).

Vector and raster geospatial data, in combination with results from the column tests, were used as inputs for calculations to estimate the aquifer capacity for attenuating COIs. Vector data consist of points, lines, and polygons and are used to spatially represent precise locations or discrete boundaries in real-world space. Raster data are matrices of cells organized into rows and columns (i.e., a grid) where each cell carries a data value. Thiessen polygons delineate area around each input point such that any location within the polygon is closer to that point than any of the other input points—effectively allocating area to each point based on the way the points are distributed across a site. A value encoded in the point, such as aquifer thickness, is applied across the entire area of the Thiessen polygon surrounding the point.

The primary geospatial data sources used in this analysis are as follows:

- Aquifer extent (the estimated maximum lateral extent of the aquifer available for attenuating COIs; based on parcel boundaries in the downgradient flow direction)
- Isoconcentration boundaries (the estimated extent of COIs at concentrations greater than the GWPS)
- Sitewide estimates for the saturated aquifer thickness and COI concentrations

A workflow was developed using the ArcGIS Model Builder application to calculate estimated saturated aquifer volumes and the mass of COIs in the aquifer. The workflow was divided into modular steps, with separate models created to execute one or more steps. A summary of each step in the workflow is as follows:

1. Interpolate Saturated Aquifer Thickness Using Thiessen Polygons: The saturated aquifer thickness across the Site was determined by interpolating saturated aquifer thickness values from boring and well construction logs. Thiessen polygons were generated from the aquifer thickness points. Because data within the Site footprint is limited, Thiessen polygons were used because they are an interpolation method that estimates data values across large distances between data points without reducing the magnitude of the values, allowing for the estimate of aquifer thickness in the interior portion of the Site where no data points were available.
2. Convert Saturated Aquifer Thickness Thiessen Polygons into Saturated Aquifer Thickness Raster: Saturated aquifer thickness Thiessen polygons were then converted into a saturated aquifer

thickness raster surface with a grid cell resolution of 50 feet by 50 feet, where each cell is encoded with the interpolated saturated aquifer thickness at that location. A 50-foot by 50-foot grid captures adequate detail given that the Site is hundreds of acres in size.

3. Create Saturated Aquifer Volume Raster: The saturated aquifer thickness raster was used to create a saturated aquifer volume raster by multiplying all thickness cells by their respective area (i.e., 50 feet by 50 feet equals 2,500 square feet). The saturated aquifer volume could then be estimated by taking the summation of all the grid cell values in the saturated aquifer volume raster.
4. Create Plume Volume Raster: For a given COI, a plume volume raster was created by taking the summation of all the grid cell values from the Saturated Aquifer Volume Raster within the isoconcentration boundary.
5. Interpolate COI Concentrations Using Thiessen Polygons: Thiessen polygons were created from the groundwater chemistry data for each COI following the same methods used to create the saturated aquifer thickness polygons by applying groundwater chemistry data to the areas surrounding each point instead of aquifer thickness values.
6. Convert COI Concentrations Thiessen Polygons into COI Concentrations Raster Surfaces: COI concentration Thiessen polygons were then converted into COI concentration raster surfaces using the same 50-foot by 50-foot cell size.
7. Estimate COI Mass Within Plumes: For each COI, mass within the plume was estimated using Equation 1.
8. Extrapolate Column Test Results to Entire Aquifer: Aquifer capacity for attenuation was determined by multiplying the mass of COI attenuated in the column studies by the total volume of saturated aquifer calculated in Step 3.

Equation 1

$$M_C = \sum_{i=1}^{n} (V_i \times C_i) \times A \times B \times p$$

where:

M_c	=	estimated mass of COIs within the plume
n	=	number of grid cells in raster
V	=	volume of grid cell
C	=	COI concentration at grid cell
A	=	conversion factor for cubic feet to liters
B	=	conversion factor for either micrograms or milligrams to kilograms
p	=	porosity

To calculate to mass of COI attenuated during the column study, the influent minus effluent concentrations were plotted on the y-axis (in µg/L) and the volume of water used in the column study was plotted on the x-axis (in liters). The area under the curve was calculated to determine the mass of COI (in micrograms) that was attenuated by column soil. An example graph is included as Figure 19. The average mass of COI attenuated by the columns was used to estimate the attenuating capacity of the entire aquifer.

The aquifer has far more potential for attenuation than the mass of arsenic and lithium requiring attenuation. Specifically, the aquifer has an attenuating capacity approximately 12 times greater than the mass of arsenic in groundwater and 24 times greater than the mass of lithium in groundwater. Aquifer capacity for attenuation results is summarized in Table 19.

10 Time to Achieve Groundwater Protection Standards (Rates) and Stability of Attenuated COIs

The slope of trend lines through recent monitoring data on concentration versus time graphs and results from reactive transport modeling were used to estimate time to achieve the applicable GWPS by natural attenuation. Constituents that are already less than their applicable GWPSs were not included in this analysis. With the exception of groundwater in the vicinity of GSD-AP-MW-2, the estimated time to achieve GWPSs by natural attenuation across the Site is expected to be less than 13 years, which is very reasonable compared to durations of other corrective action technologies. Figure 1 shows typical graphs that served as the basis for the rate analysis. The natural attenuation time frame in the vicinity of GSD-AP-MW-2 is expected to be longer (up to 80 years) based on conservative reactive transport modeling described in Section 7.

SSE performed on soils used in the column studies provides a measure of relative stability of the attenuated COIs and their hosts, such as iron oxides. The SSE fractions, from least stable to most stable, are as follows:

- F1: Water soluble
- F2: Exchangeable (e.g., clay minerals)
- F3: Reducible (e.g., poorly crystalline metal oxides such as iron oxides)
- F4: Strong acid/oxidizable (e.g., crystalline oxide and crystalline sulfide minerals)
- F5: Residual (e.g., silicate phases)

Most of the mass of arsenic and lithium in soils is relatively strongly bound to the matrix, specifically in the F3, F4, and F5 fractions. Attenuated arsenic and lithium, therefore, are not expected to remobilize back into groundwater. Post-column SSE results are summarized in Table 20.

11 Conclusions and Interpretation

Extensive geochemical and related studies demonstrate that MNA is a viable corrective action for groundwater impacts associated with the Site. The preponderance of evidence indicates that Site conditions meet USEPA's evaluation criteria for the use of MNA, specifically: area of impacts stable or shrinking, identified mechanisms for attenuation, stability of the attenuating mechanisms, sufficient aquifer capacity for attenuation, and time to achieve GWPSs reasonable as compared to other corrective action alternatives. However, MNA is one component of the Site's corrective action remedy. As noted in the *Groundwater Remedy Selection Report*, the following corrective measures were selected for the Site: source control to include dewatering, consolidation, and capping of the Site; geochemical manipulation via injections in the two areas with COIs at SSLs to remove them from groundwater and immobilize them in situ; and MNA over the entire Site.

Investigations performed to support MNA included the following:

- Preparation of concentration versus time and concentration versus distance graphs for COIs in groundwater
- Groundwater, well solids (precipitate), and soil sampling and analysis
- Laboratory analysis of well solids (precipitate) and aquifer solids (soil) samples for bulk chemistry (XRF), mineralogy (XRD), extractable iron oxides, and CEC
- Geochemical modeling
- SSE to determine associations of COIs with attenuating solids
- Column studies to assess the attenuation capacity of the aquifer soils and to determine the stability of the attenuating phases
- Calculation of the time to achieve natural attenuation

Graphs of concentration versus time for COIs at the Site indicate a reduction of some COIs in groundwater through time in some areas, specifically the following:

- Arsenic is decreasing or stable over time at GSD-AP-MW-2 and GSD-AP-MW-4.
- Lithium is decreasing over time in GSD-AP-MW-2.

Concentration versus distance graphs along downgradient transects indicate that arsenic and lithium are decreasing with distance from the areas with COIs.

Results from existing groundwater data analysis, geochemical modeling, and well solids (precipitate) analyses provide multiple lines of evidence for attenuation mechanisms for COIs operating at the Site. The major attenuation mechanisms operating at the Site include sorption on and/or coprecipitation with iron and manganese oxides (for arsenic and lithium), ion exchange on clays (for lithium), and precipitation of barium arsenate (for arsenic).

All COIs are also subject to physical attenuation mechanisms such as dispersion and flushing, which will contribute to decreased concentrations with time and distance from the areas with COIs.

Column studies were performed to assess the ability for the aquifer media (soil) to take up COIs. Laboratory results were then extrapolated to the entire saturated mass of aquifer (downgradient of the consolidated pond footprint) using quantitative GIS-based techniques. Based on the column studies and saturated volume of the downgradient aquifer, the aquifer has much more capability to attenuate (sorb) arsenic and lithium than the mass of COIs currently in groundwater. Specifically, the aquifer has an attenuating capacity 12 times the mass of arsenic in groundwater and 24 times the mass of lithium in groundwater.

SSE was performed on samples of well solids (precipitates) and soils used in the column studies to assess the stability of the attenuated COIs and their host minerals. Specific results are summarized as follows:

- Arsenic: Bound primarily in the F3 (reducible), F4 (strong acid/oxidizable) and F5 (residual) fractions, though some samples also show an association with the F2 (exchangeable) fraction. This is consistent with the identification of iron oxides and, possibly, barium arsenate as the key mechanisms for arsenic attenuation at the Site.
- Lithium: Bound primarily in the F4 (strong acid/oxidizable) and F5 (residual) fractions likely reflecting naturally occurring lithium in the silicate matrix of soil. CEC testing detected exchangeable lithium, consistent with the cation exchange on clays, as a key mechanism for lithium attenuation at the Site.

Most of the mass of arsenic and lithium in Site soils is relatively strongly bound to the soil matrix: specifically, the F3 (reducible), F4 (oxidizable), and F5 (residual) fractions. Attenuated arsenic and lithium, therefore, are not expected to remobilize back into groundwater.

Trend lines through recent groundwater data and results from reactive transport modeling were used to estimate time to achieve the applicable GWPS. For lithium, estimated time to achieve GWPSs is 13 years or less. Depending on location, estimated time to achieve GWPSs for arsenic ranges from less than 10 years for GSD-AP-MW-4 to approximately 80 years for GSD-AP-MW-2. Though these time frames are reasonable to achieve GWPSs, Site closure and injection treatment (enhanced attenuation) are expected to decrease time to achieve GWPSs over MNA alone.

12 References

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Tables

Table 1
Monitored Natural Attenuation Demonstration Status

Tier	Approach	Status of MNA Demonstration
Tier 1: Area of Impacts Stable or Shrinking	Concentration versus time and/or distance graphs; statistics; isoconcentrations in plan and/or section view; Ricker Method (part of ongoing monitoring)	Satisfied
Tier 2a: Determine Mechanisms of Attenuation	Analysis of well solids: XRF, XRD, CEC, SSE; complete analysis of groundwater (major cations and anions); geochemical modeling	Satisfied
Tier 2b: Determine Rates of Attenuation	Derived from concentration versus time graphs; batch and/or column tests; geochemical modeling	Satisfied
Tier 3a: Determine System (Aquifer) Capacity for Attenuation	Batch and/or column tests; geochemical modeling	Satisfied
Tier 3b: Determine Stability of the Attenuating Mechanisms (Solids) and COI	SSE on tested materials from batch and column tests; geochemical modeling; inference from mechanisms	Satisfied
Tier 4a: Design a Performance Monitoring Program	Additional wells; repeat well solids and/or complete groundwater analysis; triggers	Satisfied
Tier 4b: Identify Alternative Remedies Should MNA Not Perform as Expected	Completed as part of the ACM; some technologies may need further testing and/or development (bench and pilot)	Satisfied

Notes:

ACM: *Assessment of Corrective Measures*

CEC: cation exchange capacity

COI: constituent of interest

MNA: monitored natural attenuation

SSE: selective sequential extraction

XRD: X-ray diffraction

XRF: X-ray fluorescence

Table 2
Sampling Locations

Groundwater Sampling Locations				
GSD-AP-MW-2	GSD-AP-MW-2VA	GSD-AP-MW-3	GSD-AP-MW-4	GSD-AP-MW-4V
GSD-AP-MW-14	GSD-AP-MW-16	GSD-AP-MW-17	GSD-AP-MW-19H	GSD-AP-MW-20H
Well Solids Sampling Locations				
GSD-AP-MW-01	GSD-AP-MW-02	GSD-AP-MW-02VA	GSD-AP-MW-03	GSD-AP-MW-04
GSD-AP-MW-04V	GSD-AP-MW-05	GSD-AP-MW-06	GSD-AP-MW-07	GSD-AP-MW-08
GSD-AP-MW-09	GSD-AP-MW-10	GSD-AP-MW-11	GSD-AP-MW-12	GSD-AP-MW-14
GSD-AP-MW-16	GSD-AP-MW-17	GSD-AP-MW-18H	GSD-AP-MW-19H	GSD-AP-MW-20H
GSD-AP-PZ-01	GSD-AP-PZ-02	GSD-AP-PZ-05	GSD-AP-PZ-06	

Table 3
Analyzed Constituents and Laboratory Analytical Methods

Constituent	Analytical Method	Constituent	Analytical Method
Alkalinity (total as $CaCO_3$)	SM 2320 B	Lead (dissolved)	EPA 200.8
Aluminum (dissolved)	EPA 200.8	Iron (total)	EPA 200.7
Aluminum (total)	EPA 200.8	Lead (total)	EPA 200.8
Antimony (dissolved)	EPA 200.8	Lithium (total)	EPA 200.7
Antimony (total)	EPA 200.8	Magnesium (total)	EPA 200.7
Arsenic (dissolved)	EPA 200.8	Manganese (dissolved)	EPA 200.8
Arsenic (total)	EPA 200.8	Manganese (total)	EPA 200.8
Barium (total)	EPA 200.8	Molybdenum (dissolved)	EPA 200.8
Beryllium (dissolved)	EPA 200.8	Molybdenum (total)	EPA 200.8
Beryllium (total)	EPA 200.8	Nitrogen Nitrate (calculated)	EPA 353.2
Bicarbonate alkalinity (calculated)	SM 4500CO2 D	Nitrogen nitrate/nitrite	EPA 353.2
Boron (total)	EPA 200.7	Nitrogen nitrite	EPA 353.2
Cadmium (dissolved)	EPA 200.8	Ortho phosphate	SM 4500PF-OP
Cadmium (total)	EPA 200.8	Potassium (total)	EPA 200.8
Calcium (total)	EPA 200.7	Selenium (dissolved)	EPA 200.8
Carbonate Alkalinity (calculated)	SM 4500CO2 D	Selenium (total)	EPA 200.8
Chloride	SM 4500Cl E	Silica (total; calculated)	EPA 200.7
Chromium (dissolved)	EPA 200.8	Silicon (total)	EPA 200.7
Chromium (total)	EPA 200.8	Sodium (total)	EPA 200.7
Cobalt (dissolved)	EPA 200.8	Sulfate	SM 4500SO4 E 2011
Cobalt (total)	EPA 200.8	Thallium (dissolved)	EPA 200.8
Fluoride	SM 4500F G 2017	Thallium (total)	EPA 200.8
Iron (dissolved)	EPA 200.7	Total organic carbon	SM 5310 B

Notes:

$CaCO_3$: calcium carbonate

EPA: U.S. Environmental Protection Agency (method)

SM: Standard Method

Table 4
Saturation Indices for Groundwater Samples

Sample ID	Well Designation	Gibbsite	$Fe(OH)_3(a)$	Goethite	Hematite	Magnetite	Siderite	$Ba_3(AsO_4)_2$	Pyrolusite	Bixbyite	Birnessite	Hausmannite	Manganite	Pyrochroite	Lithiophorite	Rhodochrosite
GSD-AP-MW-2	Downgradient	--	**0.46**	**6.30**	**14.6**	**16.3**	**0.76**	**9.11**	-14.4	-14.1	-16.4	-15.5	-7.09	-5.87	--	**0.85**
GSD-AP-MW-2VA	Vertical delineation	--	--	--	--	--	--	**8.67**	-14.5	-14.6	-16.5	-16.3	-7.30	-6.18	--	-0.64
GSD-AP-MW-3	Downgradient	--	-0.63	**5.11**	**12.2**	**10.4**	-2.02	--	-11.7	-12.6	-13.2	-15.5	-6.08	-7.12	--	**0.10**
GSD-AP-MW-4	Downgradient	--	-0.12	**5.66**	**13.3**	**15.1**	**0.99**	--	-17.2	-18.0	-18.9	-20.6	-8.86	-6.95	--	-0.15
GSD-AP-MW-4V	Vertical delineation	--	**0.06**	**5.79**	**13.6**	**15.2**	-0.24	--	-15.7	-15.4	-17.2	-17.0	-7.45	-5.81	--	-0.19
GSD-AP- MW-14	Upgradient	-0.95	--	--	--	--	--	-8.11	-13.8	-20.4	-15.3	-29.0	-9.95	-12.7	**1.13**	--
GSD-AP- MW-16	Upgradient	-0.85	--	--	--	--	--	-7.83	-9.56	-16.1	-10.9	-24.6	-7.72	-12.6	**1.90**	--
GSD-AP- MW-17	Upgradient	--	--	--	--	--	--	--	-11.6	-11.7	-13.5	-13.6	-5.80	-6.27	--	-0.71
GSD-AP-MW-19H	Horizontal delineation	--	-0.01	**5.74**	**13.5**	**13.5**	-0.61	--	-14.3	-15.8	-15.9	-19.1	-7.72	-7.64	--	-0.72
GSD-AP-MW-20H	Horizontal delineation	--	**0.06**	**5.74**	**13.5**	**13.4**	-0.44	**3.34**	-12.9	-13.0	-14.2	-15.1	-6.15	-6.19	--	**0.90**

Notes:

SI for Gadsden groundwater samples collected August 3 through 7, 2020.

Bold indicates positive SI values (i.e., groundwater supersaturated with respect to mineral phase).

--: No SI calculated because one or more constituent(s) in phase was not detected in groundwater sample.

SI: saturation indices

Table 5
Geochemical Analysis of Monitoring Well and Aquifer Solids

Analysis	Description	Relevance to MNA Demonstration
CEC	Determines if cation exchange on clays is an attenuating mechanism.	Supports Tier 2 (mechanisms) and Tier 3 (stability) for cation exchange.
SSE	Determines which attenuating solid phases are associated with arsenic and lithium.	Supports Tier 2 (mechanisms) and Tier 3 (stability) of attenuating phases.
XRD	Identifies and provides mineralogy of crystalline attenuating phases.	Supports Tier 2 (mechanisms) and Tier 3 (stability) of attenuation involving crystalline mineral phases.
XRF	Provides bulk chemistry and presence of arsenic. (Lithium is too light to be detected by XRF.)	Relationships are determined among elements in attenuating phases (e.g., iron and manganese) and arsenic. Supports Tier 2 (mechanisms) and Tier 3 (stability).

Notes:

CEC: cation exchange capacity

MNA: monitored natural attenuation

SSE: selective sequential extraction

XRD: X-ray diffraction

XRF: X-ray fluorescence

Table 6
Bulk Chemistry of Well Solids Samples by XRF

Well ID	Arsenic	Cobalt	Iron	Manganese	Aluminum	Calcium	Magnesium	Potassium	Silicon
GSD-AP-MW-01	18	<LOD	47,236	366	25,102	5,572	2,092	6,216	259,162
GSD-AP-MW-02	3,683	<LOD	83,684	1,221	58,343	27,809	7,154	15,782	222,329
GSD-AP-MW-02[1]	3,687	<LOD	83,766	1,175	58,899	27,475	7,283	15,890	222,122
GSD-AP-MW-03	7	<LOD	26,541	695	34,502	14,084	4,169	10,604	315,789
GSD-AP-MW-04	29	<LOD	62,544	532	33,531	11,290	2,882	11,536	213,893
GSD-AP-MW-04V	6	<LOD	39,294	694	48,971	101,311	6,853	12,619	221,623
GSD-AP-MW-05	3	<LOD	45,959	513	58,937	48,294	5,304	14,838	225,884
GSD-AP-MW-06	3	<LOD	21,626	301	21,893	21,446	3,691	7,643	225,888
GSD-AP-MW-07	12	<LOD	54,106	277	31,604	2,940	3,410	11,681	293,676
GSD-AP-MW-08	117	<LOD	379,868	842	22,155	5,407	10,728	6,349	98,293
GSD-AP-MW-09	5	<LOD	26,840	277	32,768	4,036	5,708	11,163	324,630
GSD-AP-MW-10	<LOD	<LOD	9,661	<LOD	25,403	10,167	<LOD	1,288	194,802
GSD-AP-MW-10[2]	35	<LOD	96,517	1,039	64,432	44,479	9,002	20,502	340,483
GSD-AP-MW-10(2)	16	193	74,681	831	46,947	43,641	4,767	14,890	235,396
GSD-AP-MW-11	13	144	48,688	434	45,398	4,608	2,102	15,200	282,831
GSD-AP-MW-12	6	85	23,827	246	40,160	3,565	<LOD	11,858	327,455
GSD-AP-MW-14	<LOD	<LOD	14,201	34	23,929	963	<LOD	4,850	404,249
GSD-AP-MW-16	6	<LOD	40,101	386	52,876	31,010	10,783	13,401	251,998
GSD-AP-MW-17	5	112	28,054	417	39,524	167,430	7,139	11,459	163,152
GSD-AP-MW-18H	12	86	32,939	350	24,699	1,408	2,882	8,791	335,956
GSD-AP-MW-19H	7	<LOD	38,082	549	48,036	5,717	6,530	14,529	287,753
GSD-AP-MW-20H	8	<LOD	34,411	902	43,736	20,082	2,583	11,780	282,671
GSD-AP-PZ-01	9	123	47,967	991	47,670	33,366	6,100	11,977	274,083
GSD-AP-PZ-02	3	<LOD	35,580	141	46,259	3,137	5,983	14,963	285,240
GSD-AP-PZ-05	18	<LOD	56,557	2,845	36,952	1,416	4,551	10,212	312,253
GSD-AP-PZ-06	8	<LOD	45,349	211	38,306	969	1,819	9,452	306,149
GSD-AP-MS-08	137	<LOD	369,309	880	19,330	4,980	<LOD	5,929	90,211
GSD-AP-MS-08[1]	114	<LOD	368,614	875	18,513	4,915	<LOD	5,845	90,884

Notes:

1: Duplicate

2: Sample reanalyzed

Units are in milligrams per kilogram.

<LOD: less than the limit of detection

XRF: X-ray fluorescence

Table 7

Minerals Identified in Well Solids Samples by XRD[1]

Sample ID	Carbonates		Clay Minerals			Mica			Feldspar	Quartz
	Calcite	Dolomite	Montmorillonite	Bentonite	Kaolinite	Biotite	Muscovite	Chlorite	Albite	
GSD-AP-MW-02	5.6	1.9	0.2		27.8	2.1			14.8	47.6
GSD-AP-PZ-01	1.5	2.2			9.8	3.9			9.3	73.3
GSD-AP-MW-04V	18.7	23.7		2.2	8.2				9.6	37.6
GSD-AP-MW-04	0.7	1.2		3.1	13				3.6	78.4
GSD-AP-MW-10	1.2	2.3				12.9		11.4	7.9	64.3
GSD-AP-MW-11							16.0	2.9	7.3	73.8

Notes:

1: Estimated concentration (weight percent) reported where available.

XRD: X-ray diffraction

Table 8
Cation Exchange Capacity of Well Solids Samples

Sample ID	Exchangeable Cations (meq/kg soil)						CEC (meq/kg soil)
	Aluminum	Calcium	Lithium	Magnesium	Potassium	Sodium	
GSD-AP-MW-02	0.205 U	**569**	0.0266 U	**21.9**	**5.24**	**6.03**	**602**
GSD-AP-PZ-01	0.139 U	**351**	0.0181 U	**8.31**	**1.39**	**0.762**	**361**
GSD-AP-MW-04V	0.163 U	**399**	0.0211 U	**20.9**	**1.86**	**2.71**	**424**
GSD-AP-MW-04	0.125 U	**56.7**	0.0162 U	**3.55**	**0.462**	**3.14**	**63.9**
GSD-AP-MW-10(2)	0.261 U	**631**	0.0339 U	**12.7**	**1.17**	**2.97**	**648**
GSD-AP-MW-11	0.16 U	**60.5**	0.0208 U	**10.7**	**0.905**	**3.88**	**76.0**

Notes:

Bold indicates detected values.

CEC: cation exchange capacity

meq/kg: milliequivalents per kilogram

U: compound analyzed for but not detected above detection limit

Table 9
Cation Exchange Capacity of Aquifer Solids Samples

Sample ID	Depth Interval (feet bgs)	Exchangeable Cations (meq/kg soil)						CEC (meq/kg soil)
		Aluminum	Calcium	Lithium	Magnesium	Potassium	Sodium	
GSD-AP-MW-2VB	11.5-13	0.125 U	**22.5**	0.0161 U	**8.36**	**2.42**	**0.682**	**34.0**
GSD-AP-MW-2VB	13.0-14.5	0.125 U	**15.7**	0.0162 U	**6.99**	**2.08**	**0.522**	**25.3**
GSD-AP-MW-2VB[1]	13.0-14.5	0.125 U	**14**	0.0162 U	**6.04**	**1.76**	**0.46**	**22.3**
GSD-AP-MW-2VB	14.5-16.0	0.125 U	**13.7**	0.0162 U	**4.64**	**1.3**	**0.461**	**20.1**
GSD-AP-MW-2VB	16.0-17.5	0.125 U	**92.2**	**0.0167 J**	**5.88**	**1.88**	**0.55**	**101**
GSD-AP-MW-2VB	17.5-19.0	0.125 U	**354**	**0.0385**	**23.7**	**4.88**	**1.71**	**384**
GSD-AP-MW-2VB	19.0-20.5	0.125 U	**382**	**0.0465**	**31.4**	**4.92**	**1.97**	**420**
GSD-AP-MW-2VB	20.5-21.0	0.125 U	**107**	**0.0565**	**30.5**	**5.13**	**1.84**	**145**

Notes:

Bold indicates detected values.

1. Duplicate

bgs: below ground surface

CEC: cation exchange capacity

J: estimated value

meq/kg: milliequivalents per kilogram

U: compound analyzed for but not detected above detection limit

Table 10
Extractable Aluminum, Manganese, and Iron Oxides

Sample ID	Depth Interval (feet bgs)	Extractable Oxides (mg/kg soil)			Simultaneously Extractable Metals (mg/kg)	
		Aluminum	Iron	Manganese	Arsenic	Lithium
GSD-AP-MW-02	NA[2]	**950**	**25800**	**713 E**	**3470 E**	1.25 U
GSD-AP-PZ-01	NA[2]	**663**	**13700**	**700 E**	**4.77**	1.28 U
GSD-AP-MW-04V	NA[2]	**312**	**2640**	**112**	**0.862**	1.15 U
GSD-AP-MW-04	NA[2]	**394**	**23800**	**202**	**23**	1.2 U
GSD-AP-MW-10(2)	NA[2]	**660**	**40800 E**	**454**	**14**	1.13 U
GSD-AP-MW-11	NA[2]	**479**	**25400 E**	**188**	**10.4**	1.11 U
GSD-AP-MW-2VB-11.5-13.0	11.5-13	**1070**	**903**	**95.8**	**2.1**	0.909 U
GSD-AP-MW-2VB-11.5-13.0[1]	11.5-13	**896**	**758**	**83**	**1.92**	0.896 U
GSD-AP-MW-2VB-13.0-14.5	13.0-14.5	**881**	**701**	**60.9**	**1.07**	0.87 U
GSD-AP-MW-2VB-14.5-16.0	14.5-16.0	**432**	**366**	**28.7**	**0.835**	0.947 U
GSD-AP-MW-2VB-16.0-17.5	16.0-17.5	**476**	**740**	**23.5**	**0.364 J**	0.961 U
GSD-AP-MW-2VB-17.5-19.0	17.5-19.0	**655**	**1770**	**444 E**	**1.06**	0.976 U
GSD-AP-MW-2VB-19.0-20.5	19.0-20.5	**878**	**1890**	**1150 E**	**1.68**	**1.15 J**
GSD-AP-MW-2VB-20.5-21.0	20.5-21.0	**978**	**2390**	**1440 E**	**1.44**	**1.14 J**

Notes:
Bold indicates detected values.
1. Duplicate
2. Precipitate sample
Extractable oxides determined by acid ammonium oxalate method.
E: reanalysis requested; results may be updated
J: estimated value
bgs: below ground surface
mg/kg: milligrams per kilogram
NA: not applicable
U: compound analyzed for but not detected above detection limit

Table 11
Bulk Chemistry by XRF (Aquifer Solids)

Boring Location	Depth Interval (feet bgs)	Units	Arsenic	Iron	Manganese	Barium	Calcium	Potassium	Sulfur	Strontium
GSD-AP-MW-2VB	11.5–13	ppm	10	47,961	323	200	1,967	10,900	<LOD	26
GSD-AP-MW-2VB	13–14.5	ppm	4	21,299	252	182	1,860	10,873	<LOD	27
GSD-AP-MW-2VB	14.5–16	ppm	<LOD	15,984	227	205	1,192	11,358	<LOD	25
GSD-AP-MW-2VB	16–17.5	ppm	<LOD	10,896	192	166	7,335	8,256	469	37
GSD-AP-MW-2VB	17.5–19	ppm	6	51,910	753	190	10,686	14,739	2,253	140
GSD-AP-MW-2VB	19–20.5	ppm	10	71,049	1,192	312	6,450	16,057	2,132	167
GSD-AP-MW-2VB	20.5–21	ppm	11	93,441	1,946	368	3,981	15,488	1,777	135

Notes:

Samples were analyzed on April 13, 2021.

bgs: below ground surface

ppm: parts per million

XRF: X-ray fluorescence

<LOD: less than limit of detection

Table 12

Minerals Identified in Aquifer Solids Samples by XRD[1]

Sample ID	Depth Interval (feet bgs)	Iron Oxide	Clay Minerals			Feldspar		Quartz
		Goethite	Montmorillonite	Bentonite	Kaolinite	Albite	Anorthite	
GSD-AP-MW-2VB	11.5-13	9.1		18.2	15.4	2.2		55.1
GSD-AP-MW-2VB	13.0-14.5			1.7	0.9	1.6		95.8
GSD-AP-MW-2VB	14.5-16.0			0.5		1.4		98.2
GSD-AP-MW-2VB	16.0-17.5			0.5		1.5		98.1
GSD-AP-MW-2VB	17.5-19.0		0.1	11.6	14.6		11.2	62.4
GSD-AP-MW-2VB	19.0-20.5		0.1	16.6	16.9	11.0		55.3
GSD-AP-MW-2VB	20.5-21.0		0.1	18.0	21.2	6.4		54.3

Notes:

1: Estimated concentration (weight percent) reported where available.

bgs: below ground surface

XRD: X-ray diffraction

Table 13
Geochemical Evidence for Attenuation Mechanisms

Mechanism	Geochemical Modeling	XRF	XRD	SSE	CEC
Sorption on and/or coprecipitation with iron and manganese oxides (arsenic and lithium)	X	X	X	X	
Ion exchange on clays (lithium)	X		X		X
Precipitation of barium arsenate (arsenic)	X	X			

Notes:

CEC: cation exchange capacity

SSE: selective sequential extraction

X: indicates attenuation for arsenic and/or lithium

XRD: X-ray diffraction

XRF: X-ray fluorescence

Table 14
Groundwater Chemistry Data Used in the 1D Reactive Transport Models

		Transect 1			Transect 2		
Sample Location ID:		**MW-20H**	**MW-2**	**MW-11**	**MW-20H**	**MW-4**	**MW-8**
Analyte	**Units**	**Background**	**Upgradient**	**Downgradient**	**Background**	**Upgradient**	**Downgradient**
eH	V	0.209	0.137	0.172	0.209	0.117	0.166
pe	SU	3.60	2.35	2.96	3.60	2.02	2.87
pH	SU	6.36	6.65	6.38	6.36	6.68	6.29
DO	mg/L	0.15	0.14	0.11	0.15	0.18	0.13
Alkalinity	mg/L	163	162	132	163	123	164
Arsenic	mg/L	0.002	0.727	0.002	0.002	0.013	0.003
Barium	mg/L	0.197	0.081	0.165	0.197	0.181	0.235
Calcium	mg/L	47.6	80.5	111	47.6	22.8	55.5
Chloride	mg/L	6.73	2.00	4.74	6.73	8.96	5.16
Cobalt	mg/L	0.010	0.030	0.006	0.010	0.023	0.004
Iron	mg/L	3.34	13.2	11.2	3.34	42.3	8.51
Lithium	mg/L	0.02 U	0.041	0.02 U	0.02 U	0.02 U	0.02 U
Magnesium	mg/L	14.7	9.42	17.6	14.7	6.02	6.24
Manganese	mg/L	29.3	6.53	7.50	29.3	1.04	2.25
Potassium	mg/L	2.62	8.89	2.15	2.62	2.33	0.470
Sodium	mg/L	15.6	5.07	15.0	15.6	11.8	10.0
Sulfate	mg/L	112	114	280	112	15.5	16.1

Notes:

Groundwater chemistry data is from August 25–26, 2020.

Thick border indicates transect constituent of interest at a statistically significant level.

DO: dissolved oxygen

mg/L: milligrams per liter

pe: a measure of oxidation-reduction potential

SU: standard unit

U: compound analyzed for but not detected above detection limit

V: volt

Table 15
Cation Exchange and Sorption Capacity for the 1D Model Transects

Constituent	Units	Transect 1	Transect 2
Cation exchange capacity[1,2]	meq/kg	40.4	316
X	meq/L	0.428	3.35
Extractable iron oxides[1,2]	mg/kg	694	2.02
≡FeOH (weak)	mol/L	0.0263	0.000077
≡FeOH (strong)	mol/L	0.0007	0.000002
Extractable aluminum oxides[1,2]	mg/kg	750	837
≡AlOH	mol/L	0.0098	0.0109

Notes:

1. The average for the MW-2VB 11.5- to 17.5-foot depth interval (gravel) was used for Transect 1, as this is the unit in which MW-2 is screened.
2. The average for the MW-2VB 17.5- to 21-foot depth interval (mudstone/shale) was used for Transect 2, as this is the unit in which MW-4 is screened.

≡AlOH: surface binding site on $Al(OH)_3$

≡FeOH (weak): weak surface binding site on $Fe(OH)_3$

≡FeOH (strong): strong surface binding site on $Fe(OH)_3$

mg/kg: milligrams per kilogram

mol/L: moles per liter

meq/kg: milliequivalents per kilogram

meq/L: milliequivalents per liter

X: ion exchange site

Table 16
Initial Groundwater Characterization Results

Parameter	Result GSD-AP-MW-2	Units
Alkalinity	117	mg/L as $CaCO_3$
Ammonia as N	0.549	mg/L
Total organic carbon	0.62	mg/L
Chloride	2.06	mg/L
Fluoride	0.44	mg/L
Nitrate as N[1]	0.02 U	mg/L
Nitrite as N	0.006 U	mg/L
Orthophosphate	0.020 U	mg/L
Sulfate	136	mg/L
Aluminum, dissolved	5 U	µg/L
Aluminum, total	5 U	µg/L
Antimony, dissolved	7 U	µg/L
Arsenic, dissolved	197	µg/L
Barium, dissolved	61.6	µg/L
Beryllium	0.3 U	µg/L
Boron, dissolved	440	µg/L
Cadmium, dissolved	0.4 U	µg/L
Calcium, dissolved	62.3	mg/L
Chromium, dissolved	2.1 U	µg/L
Cobalt, dissolved	28.1	µg/L
Iron, dissolved	5,880	µg/L
Iron, total	11,700	µg/L
Lead, dissolved	3 U	µg/L
Lithium, dissolved	30	µg/L
Magnesium, dissolved	10.2	mg/L
Manganese, dissolved	8,940	µg/L
Manganese, total	8,950	µg/L
Molybdenum, dissolved	13.4	µg/L
Nickel, dissolved	4.4	µg/L
Potassium, dissolved	6.67	mg/L
Selenium, dissolved	7 U	µg/L
Silicon, dissolved	4.66	mg/L
Silver, dissolved	2.1 U	µg/L
Sodium, dissolved	4.86	mg/L
Thallium, dissolved	4 U	µg/L
Zinc, dissolved	1.4 J	µg/L
pH	6.58	--

Notes:

Samples were field filtered with a 0.45-micron filter at the time of collection and filtered again prior to analysis for dissolved constituents.

1. Calculated as: (nitrogen, nitrate + nitrite) – (nitrogen, nitrite)

--: not applicable

µg/L: micrograms per liter

$CaCO_3$: calcium carbonate

J: indicates that the result is an estimated value

mg/L: milligrams per liter

N: nitrogen

U: indicates that the compound was analyzed for but not detected

Table 17
Site Soils and Groundwater Used in Column Tests

Column Number	Soil ID	Groundwater ID	COIs in Groundwater
1	GSD-AP-MW-2VB-11.5-13.0	GSD-AP-MW-2	Arsenic and lithium
2	GSD-AP-MW-2VB-13.5-14.5		
3	GSD-AP-MW-2VB-14.5-16.0		
4	GSD-AP-MW-2VB-16.0-17.5		
5	GSD-AP-MW-2VB-17.5-19.0		

Note:

COI: constituent of interest

Table 18
Column Test Operating Conditions

Parameter	Value	Unit
Soil/sand mixture depth	11	cm
Column Inside diameter	4.2	cm
Flow rate	0.5	mL per minute
Empty bed contact time	5.08	hours
Porosity	35	%
Dry mass of soil in column	202-261	gram
Hydraulic residence time	1.78	hours
Darcy flux	18.2	cm per day
Linear velocity	52.0	cm per day
Column test duration	12	days

Notes:
cm: centimeter
mL: milliliter

Table 19
Estimated Aquifer Capacity

COI	Estimated Maximum Mass of COI in Aquifer (kg)	Estimated Maximum Attenuating Capacity of Aquifer (kg)	Estimated Excess Attenuating Capacity of Aquifer
Arsenic	68	829	12x
Lithium	0.71	17	24x

Notes:

COI: constituent of interest

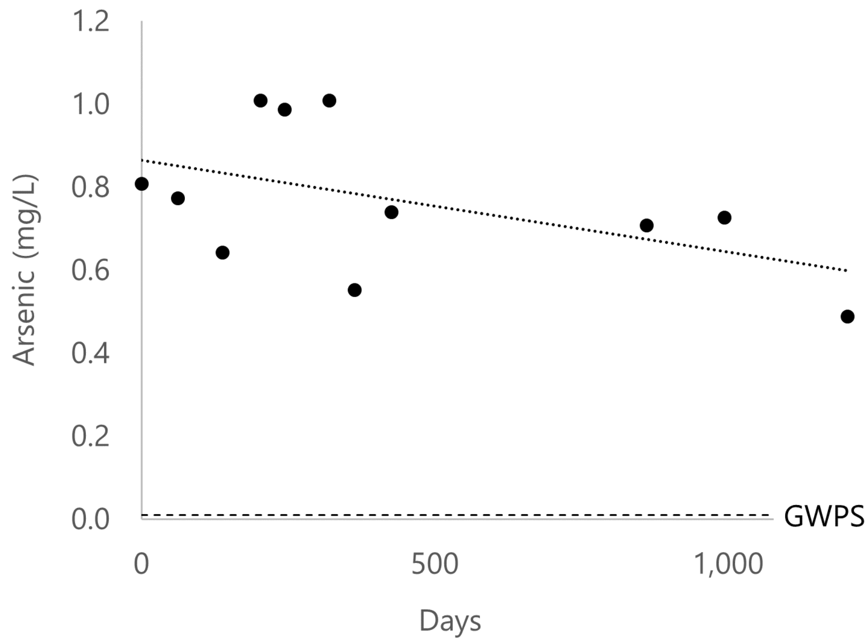
kg: kilogram

Table 20
SSE Results

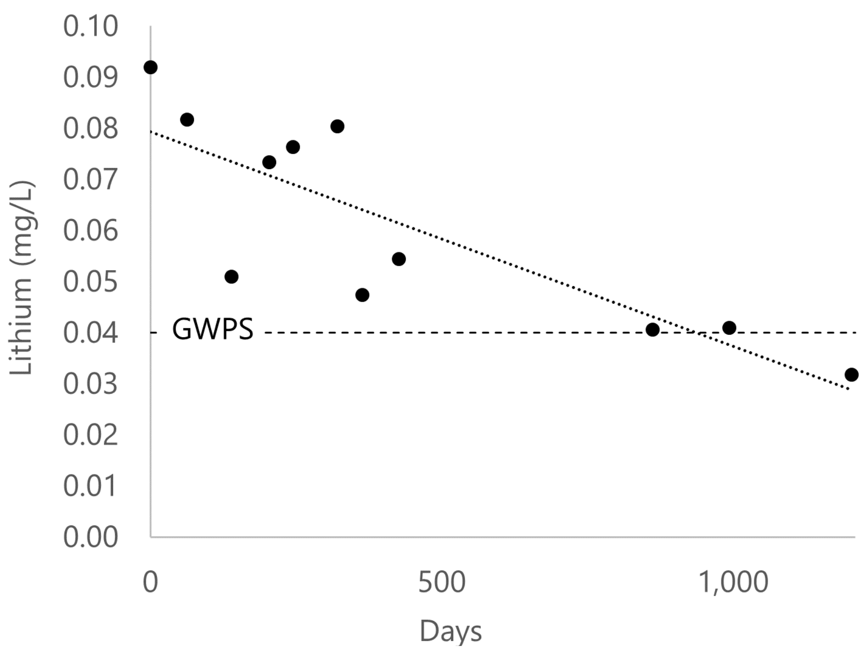
Sample ID	Sample Type	Depth Interval (feet bgs)	Arsenic (mg/kg)					Lithium (mg/kg)					Iron (mg/kg)					Manganese (mg/kg)				
			F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
GSD-AP-MW-02	Well Solids, pre-column test	NA	**13.2**	**731**	**175**	**1700**	**105**	5.84 U	5.84 U	0.584 U	**2.38 J**	**18.7**	--	117 U	**2280**	**28100**	**22700**	--	**121**	**422**	**217**	**76**
GSD-AP-PZ-01	Well Solids, pre-column test	NA	2.5 U	**2.57 J**	**0.381 J**	**2.69**	**2.59**	6.25 U	6.25 U	0.625 U	**1.44 J**	**16.4**	--	125 U	**1090**	**14800**	**22200**	--	**190**	**445**	**179**	**66.9**
GSD-AP-MW-04V	Well Solids, pre-column test	NA	2.38 U	2.38 U	0.238 U	**1.04**	**0.812 J**	5.95 U	5.95 U	0.595 U	**2.53 J**	**30.7**	--	119 U	**684**	**12200**	**24800**	--	**87.5**	**139**	**447**	**63.5**
GSD-AP-MW-04	Well Solids, pre-column test	NA	2.5 U	**5.12**	**0.506**	**4.39**	**5.67**	6.25 U	6.25 U	0.625 U	1.06 U	**4.1 J**	--	125 U	**1450**	**13600**	**9830**	--	**11.7**	**38.5**	**152**	**17.2**
GSD-AP-MW-04[1]	Well Solids, pre-column test	NA	2.45 U	**5.47**	**0.499**	**4.63**	**8.15**	6.13 U	6.13 U	0.613 U	1.04 U	**5.42**	--	123 U	**1430**	**14100**	**13100**	--	**12.2**	**39.4**	**164**	**22.3**
GSD-AP-MW-10	Well Solids, pre-column test	NA	2.48 U	2.48 U	**0.554**	**7.17**	**3.3**	6.19 U	6.19 U	0.619 U	**1.83 J**	**17.9**	--	124 U	**1510**	**41600**	**19200**	--	**60.2**	**159**	**404**	**71.9**
GSD-AP-MW-11	Well Solids, pre-column test	NA	2.5 U	2.5 U	**0.408 J**	**3.98**	**1.9**	6.25 U	6.25 U	0.625 U	1.06 U	**9.64**	--	125 U	**1480**	**21800**	**10300**	--	**25.9**	**25.8**	**91.8**	**57**
GSD-AP-MW-2VB-11.5-13.0	Soil, pre-column test	11.5-13.0	2.48 U	2.48 U	0.248 U	**0.46 J**	**1.75**	6.19 U	6.19 U	0.619 U	1.05 U	**2.64 J**	--	124 U	**249**	**1250**	**13100**	--	**19.1**	**11.9**	**7.76**	**14.6**
GSD-AP-MW-2VB-13.0-14.5	Soil, pre-column test	13.0-14.5	2.38 U	2.38 U	0.238 U	0.405 U	**0.639 J**	5.95 U	5.95 U	0.595 U	1.01 U	1.31 U	--	119 U	**198**	**742**	**3720**	--	**10.1**	**5.79**	**3.93**	**8.79**
GSD-AP-MW-2VB-13.0-14.5[1]	Soil, pre-column test	13.0-14.5	2.43 U	2.43 U	0.243 U	0.413 U	**0.706 J**	6.07 U	6.07 U	0.607 U	1.03 U	**1.53 J**	--	121 U	**224**	**679**	**5170**	--	**9.52**	**5.12**	**4.04**	**12.7**
GSD-AP-MW-2VB-14.5-16.0	Soil, pre-column test	14.5-16.0	2.34 U	2.34 U	0.234 U	0.397 U	0.488 U	5.84 U	5.84 U	0.584 U	0.993 U	1.22 U	--	117 U	**129**	**439**	**2360**	--	**9.34**	**5.54**	**2.85**	**4.83**
GSD-AP-MW-2VB-16.0-17.5	Soil, pre-column test	16.0-17.5	2.4 U	2.4 U	0.24 U	0.409 U	0.521 U	6.01 U	6.01 U	0.601 U	**2.53 J**	**3.68 J**	--	120 U	**497**	**702**	**2880**	--	**13.5**	**11.3**	**2.07**	**10.4**
GSD-AP-MW-2VB-17.5-19.0	Soil, pre-column test	17.5-19.0	2.45 U	2.45 U	0.245 U	**1.41**	**1.41**	6.13 U	6.13 U	**0.625 J**	**3.48 J**	**21.1**	--	123 U	**1460**	**7580**	**24500**	--	**87.0**	**335**	**47.3**	**77.5**
GSD-AP-MW-2VB-19.0-20.5	Soil, pre-column test	19.0-20.5	2.5 U	2.5 U	**0.36 J**	**1.92**	**1.83**	6.25 U	6.25 U	**1 J**	**2.63 J**	**21.6**	--	125 U	**1400**	**11200**	**31100**	--	**147**	**788**	**158**	**86.2**
GSD-AP-MW-2VB-20.5-21.0	Soil, pre-column test	20.5-21.0	2.48 U	2.48 U	**0.32 J**	**1.07**	**1.59**	6.19 U	6.19 U	**0.905 J**	1.05 U	**15.6**	--	124 U	**1040**	**8030**	**41000**	--	**157**	**955**	**114**	**111**
GSD-AP-MW-2VB-11.5-13.0	Soil, post-column test	11.5-13.0	2.64 U	2.64 U	0.264 U	**0.558 J**	**2.02**	6.61 U	6.61 U	0.661 U	1.12 U	**1.76 J**	--	132 U	**141**	**962**	**17000**	--	**17**	**9.11**	**4.45**	**14.4**
GSD-AP-MW-2VB-11.5-13.0[1]	Soil, post-column test	11.5-13.0	2.54 U	**2.78 J**	0.254 U	**0.45 J**	**2.06**	6.36 U	6.36 U	0.636 U	1.08 U	**2.18 J**	--	127 U	**136**	**874**	**16100**	--	**16.0**	**8.56**	**4.02**	**14.2**
GSD-AP-MW-2VB-13.0-14.5	Soil, post-column test	13.0-14.5	2.23 U	2.23 U	0.223 U	**0.454 J**	**1.31**	5.58 U	5.58 U	0.558 U	0.948 U	**2.34 J**	--	112 U	**135**	**596**	**8250**	--	**7.90**	**4.28**	**2.37**	**24**
GSD-AP-MW-2VB-14.5-16.0	Soil, post-column test	14.5-16.0	1.99 U	1.99 U	0.199 U	0.339 U	**0.549 J**	4.98 U	4.98 U	0.498 U	0.847 U	1.3 U	--	99.7 U	**70.7**	**292**	**3600**	--	**8.93**	**2.78**	**1.65**	**6.52**
GSD-AP-MW-2VB-16.0-17.5	Soil, post-column test	16.0-17.5	2.05 U	2.05 U	0.205 U	0.349 U	**0.523**	5.13 U	5.13 U	0.513 U	**1.95 J**	**4.14 J**	--	103 U	**314**	**788**	**3090**	--	**8.95**	**11.8**	**2.60**	**11**
GSD-AP-MW-2VB-17.5-19.0	Soil, post-column test	17.5-19.0	2.14 U	2.14 U	**0.323 J**	**1.53**	**1.14**	5.35 U	5.35 U	0.535 U	0.909 U	**12.2**	--	107 U	**1160**	**6060**	**18100**	--	**89.0**	**259**	**59.1**	**51.6**

Notes:
Bold indicates detected values.
1. Duplicate
F: fraction
F1: soluble
F2: exchangeable
F3: reducible (iron/manganese oxide bound)
F4: oxidizable (sulfide/organic/crystalline oxide bound)
F5: residual
--: not measured
bgs: below ground surface
J: estimated value
mg/kg: milligrams per kilogram
NA: not applicable
SSE: selective sequential extraction
U: compound analyzed for but not detected above detection limit

Figures

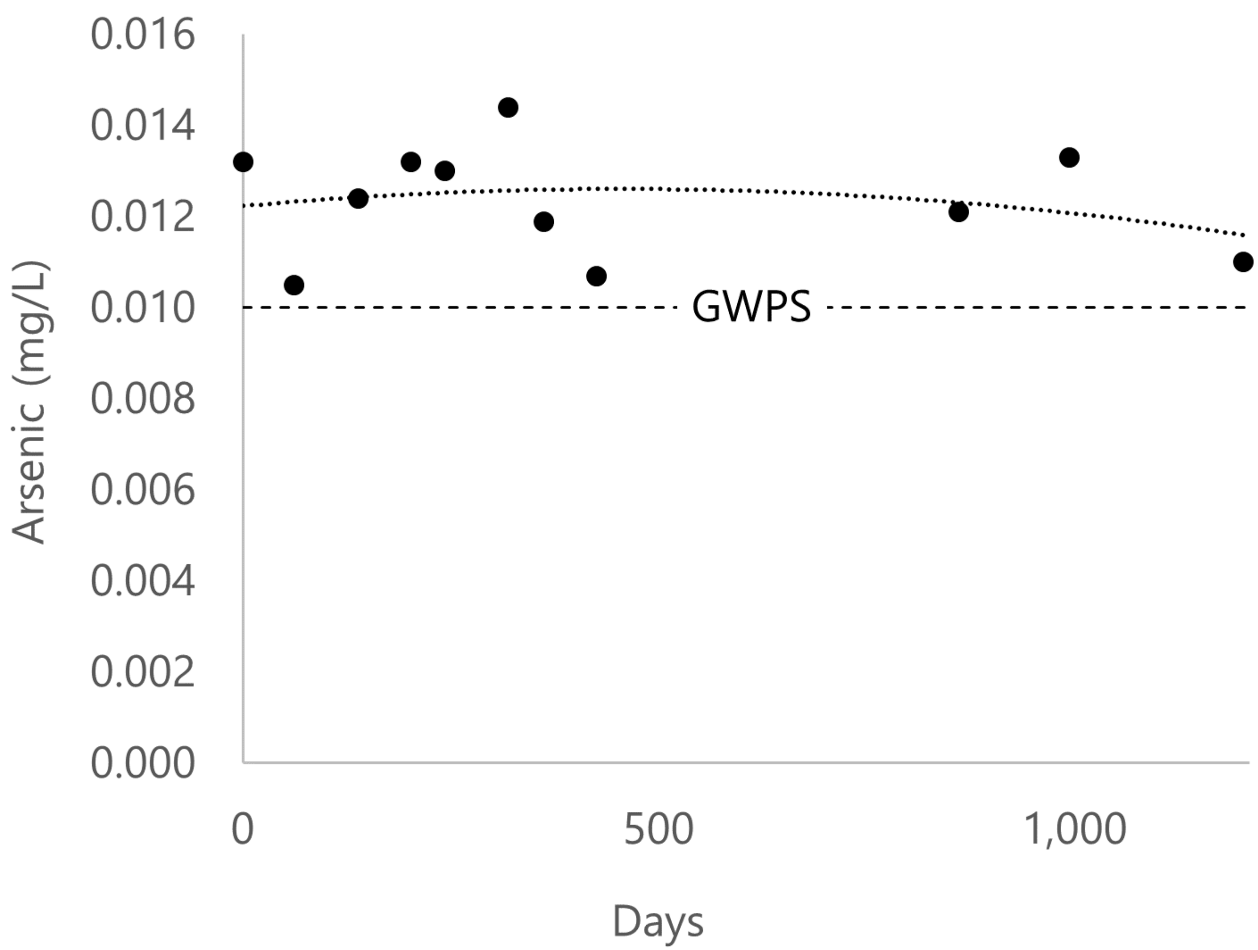


GSD-AP-MW-2



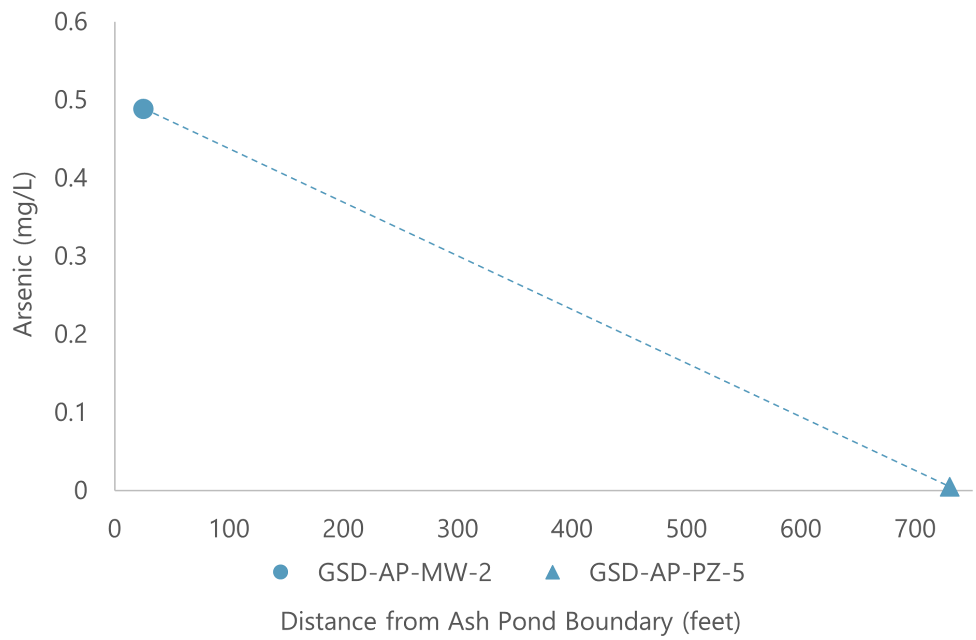
GSD-AP-MW-2

Notes:
GWPS: groundwater protection standard
mg/L: milligrams per liter

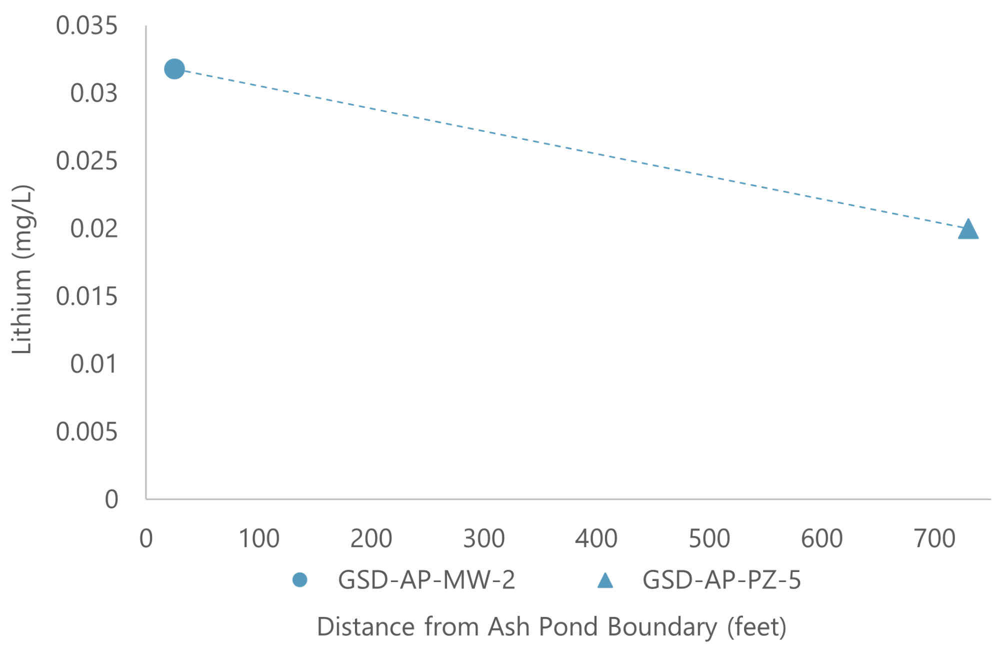


GSD-AP-MW-4

Notes:
GWPS: groundwater protection standard
mg/L: milligrams per liter

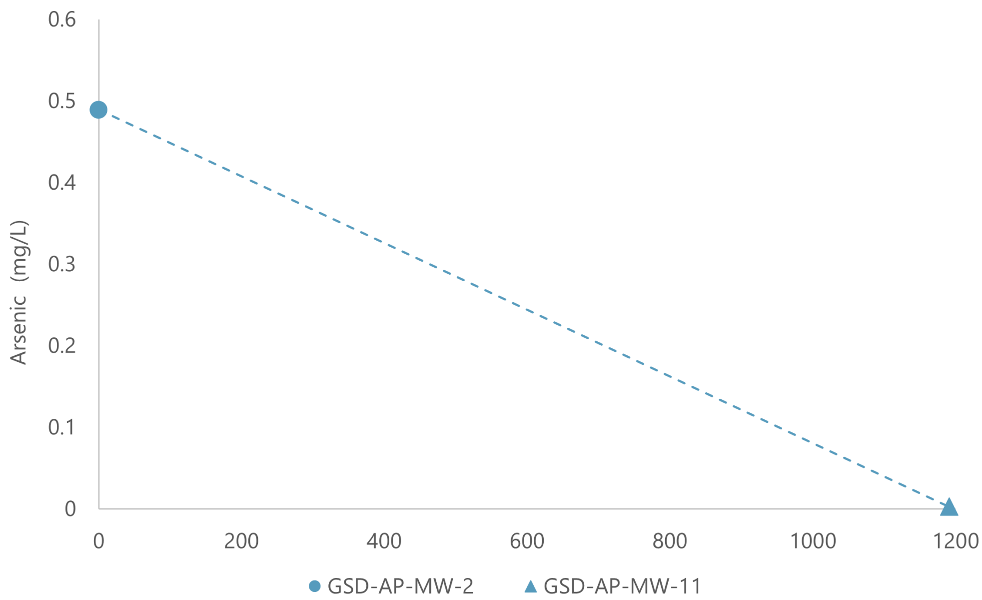


GSD-AP-MW-2 to GSD-AP-PZ-5 (Arsenic)

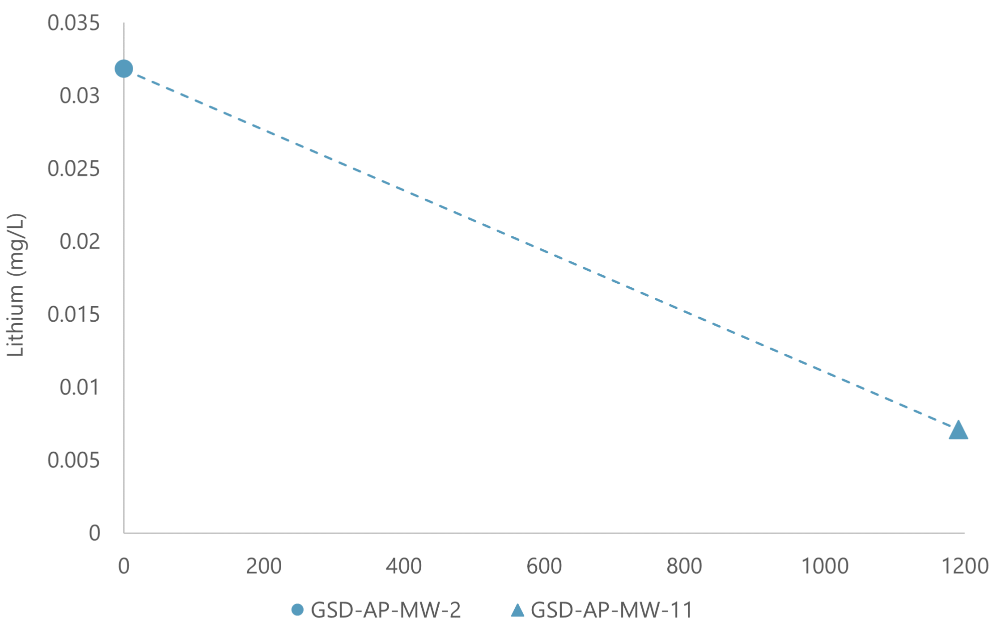


GSD-AP-MW-2 to GSD-AP-PZ-5 (Lithium)

Notes:
Groundwater flow direction is assumed to be toward the northeast.
mg/L: milligrams per liter

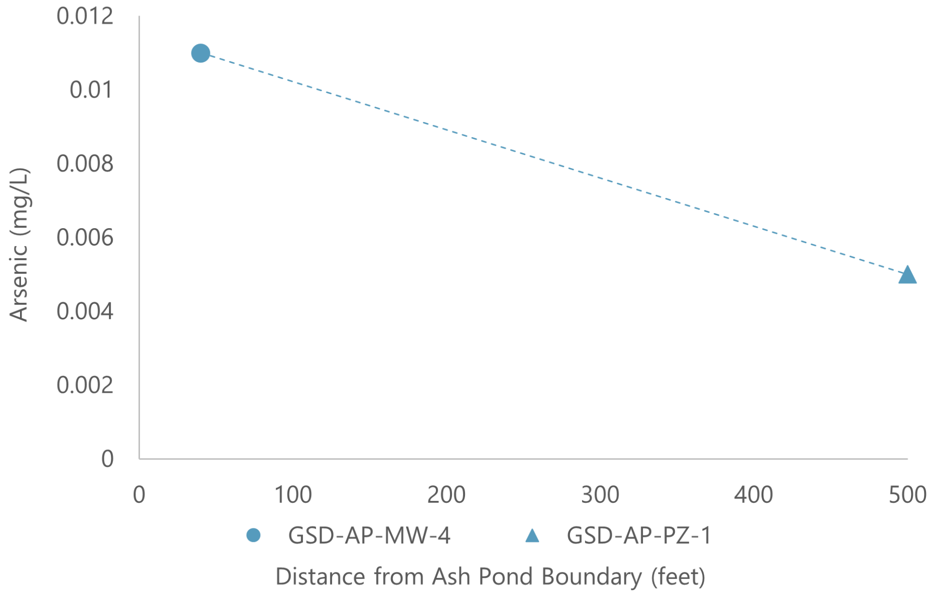


GSD-AP-MW-2 to GSD-AP-MW-11 (Arsenic)

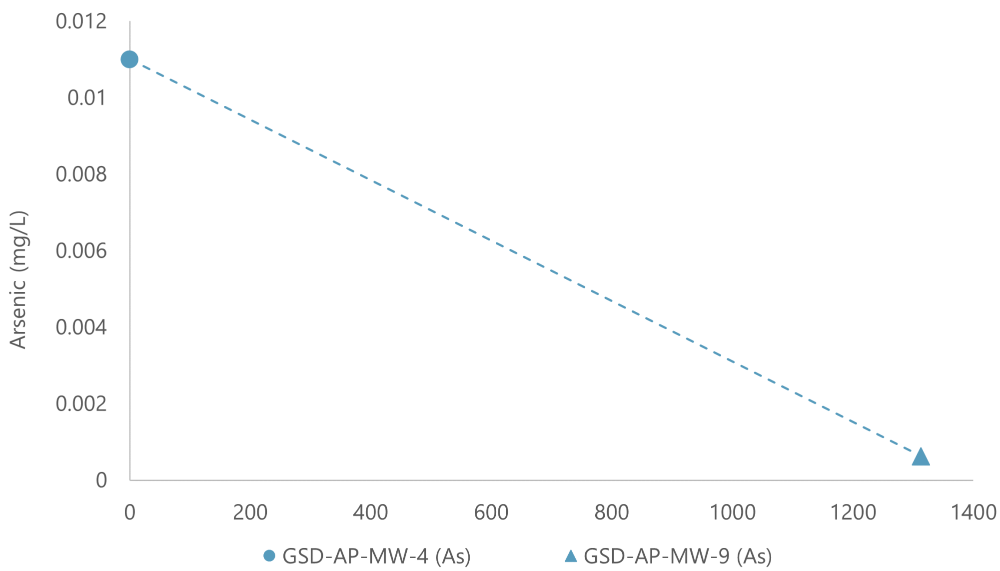


GSD-AP-MW-2 to GSD-AP-MW-11 (Lithium)

Notes:
Groundwater flow direction is assumed to be toward the southwest.
mg/L: milligrams per liter

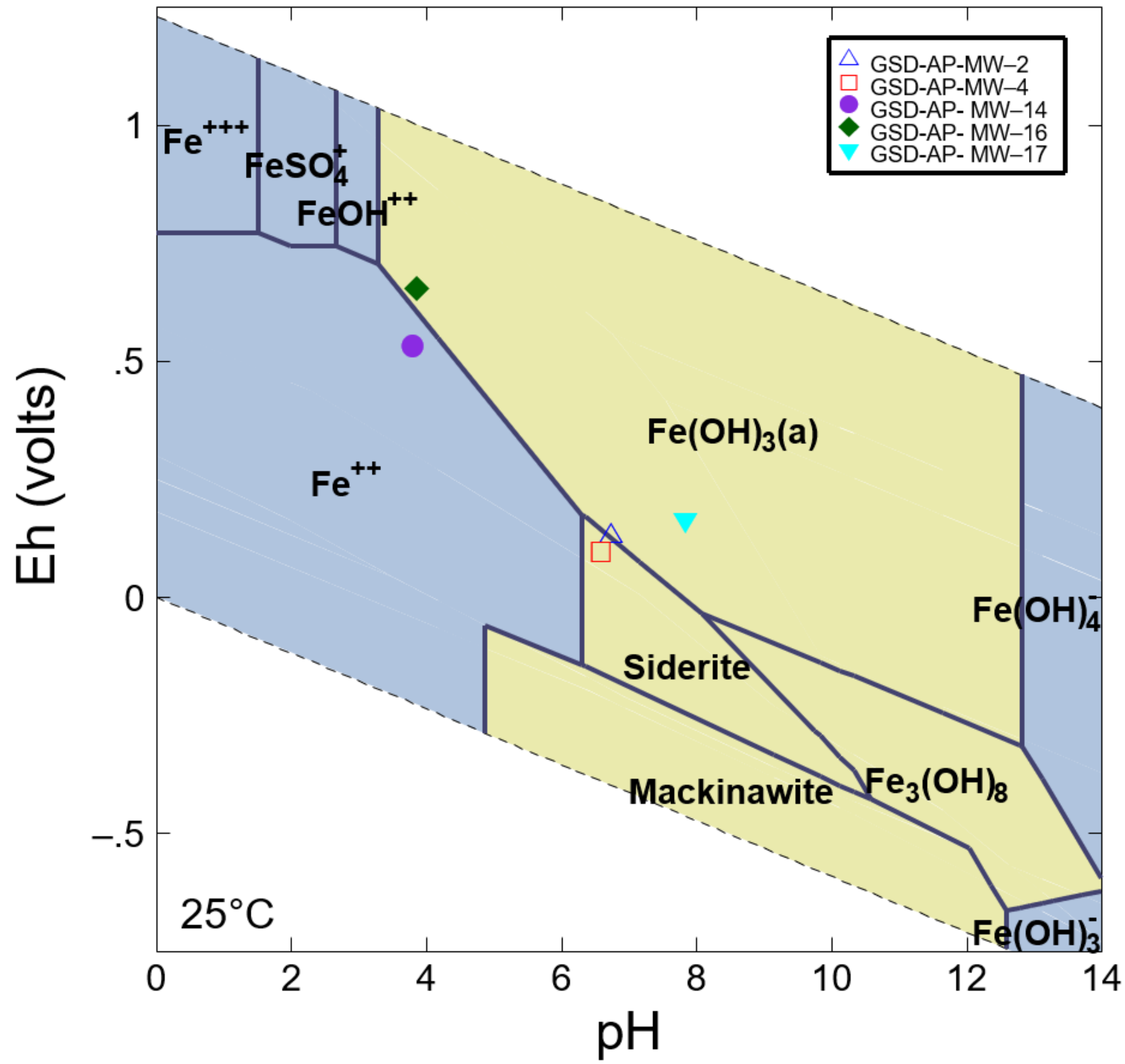


GSD-AP-MW-4 to GSD-AP-PZ-1 (Arsenic)[1]



GSD-AP-MW-4 to GSD-AP-MW-9 (Arsenic)[2]

Notes:
1. Groundwater flow path is assumed to be toward the northeast.
2. Groundwater flow direction is assumed to be toward the southwest.
mg/L: milligrams per liter



Note:
Blue fields indicate dissolved/mobile species. Yellow fields indicate solid/attenuated species.

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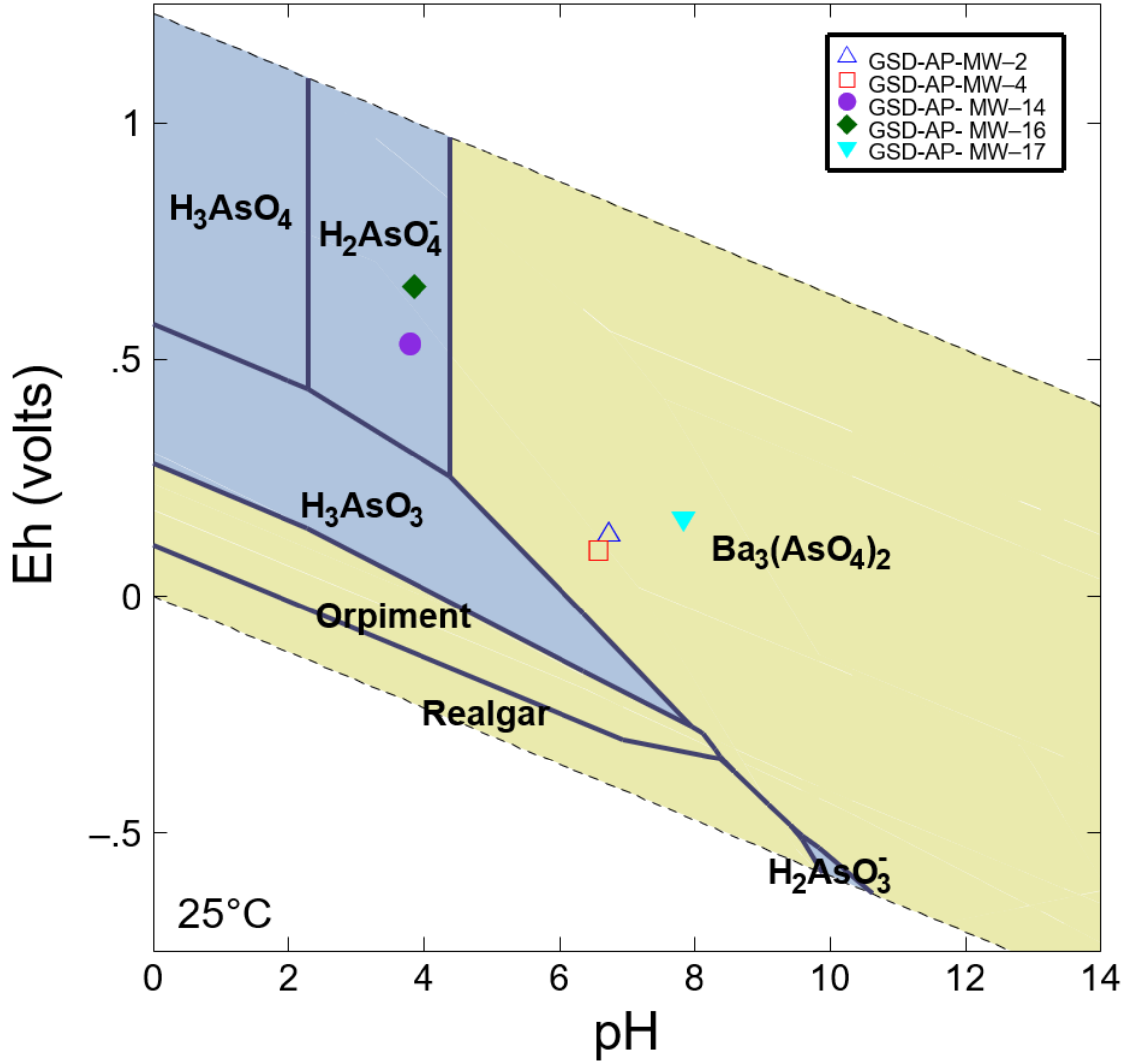
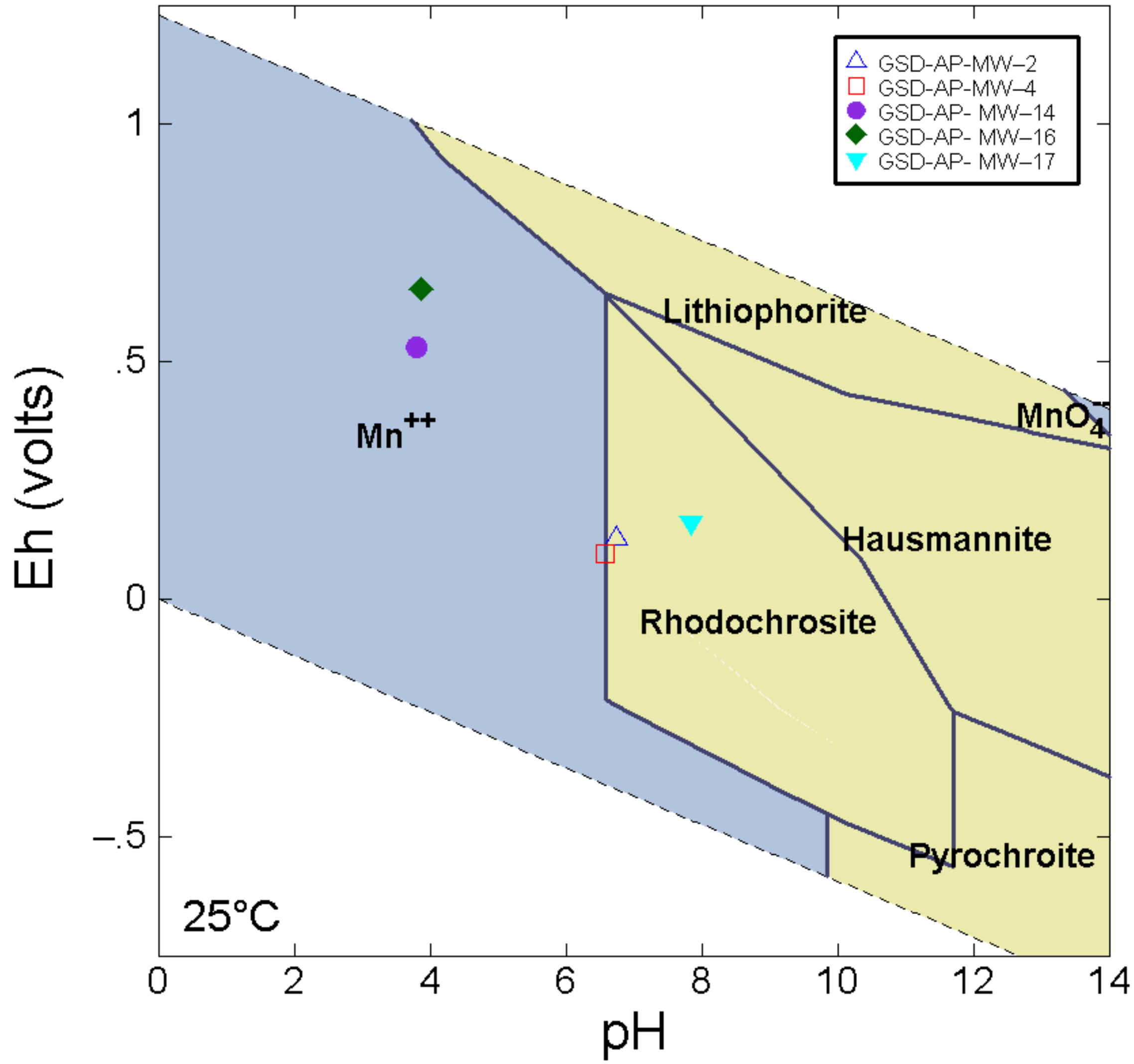
Figure 3
Eh-pH Stability Diagram for Dissolved and Solid Iron Phases
Monitored Natural Attenuation Demonstration
Plant Gadsden



Note:
Blue fields indicate dissolved/mobile species. Yellow fields indicate solid/attenuated species.

Figure 4
Eh-pH Stability Diagram for Dissolved and Solid Arsenic Phases



Note:
Blue fields indicate dissolved/mobile species. Yellow fields indicate solid/attenuated species.

Figure 5
Eh-pH Stability Diagram for Dissolved and Solid Manganese Phases
Monitored Natural Attenuation Demonstration
Plant Gadsden

LEGEND:
- Plant Gadsden Ash Pond Boundary
- Monitoring Well Location
- Groundwater Sample
- Soil Sample
- Arsenic SSL
- Arsenic and Lithium SSLs
- Model Transect

NOTE:
SSL: statistically significant level

Groundwater Samples:
- GSD-AP-MW-2
- GSD-AP-MW-4
- GSD-AP-MW-4V
- GSD-AP-PZ-1

Soil Sample:
- GSD-AP-MW-2VB

0 500
Feet

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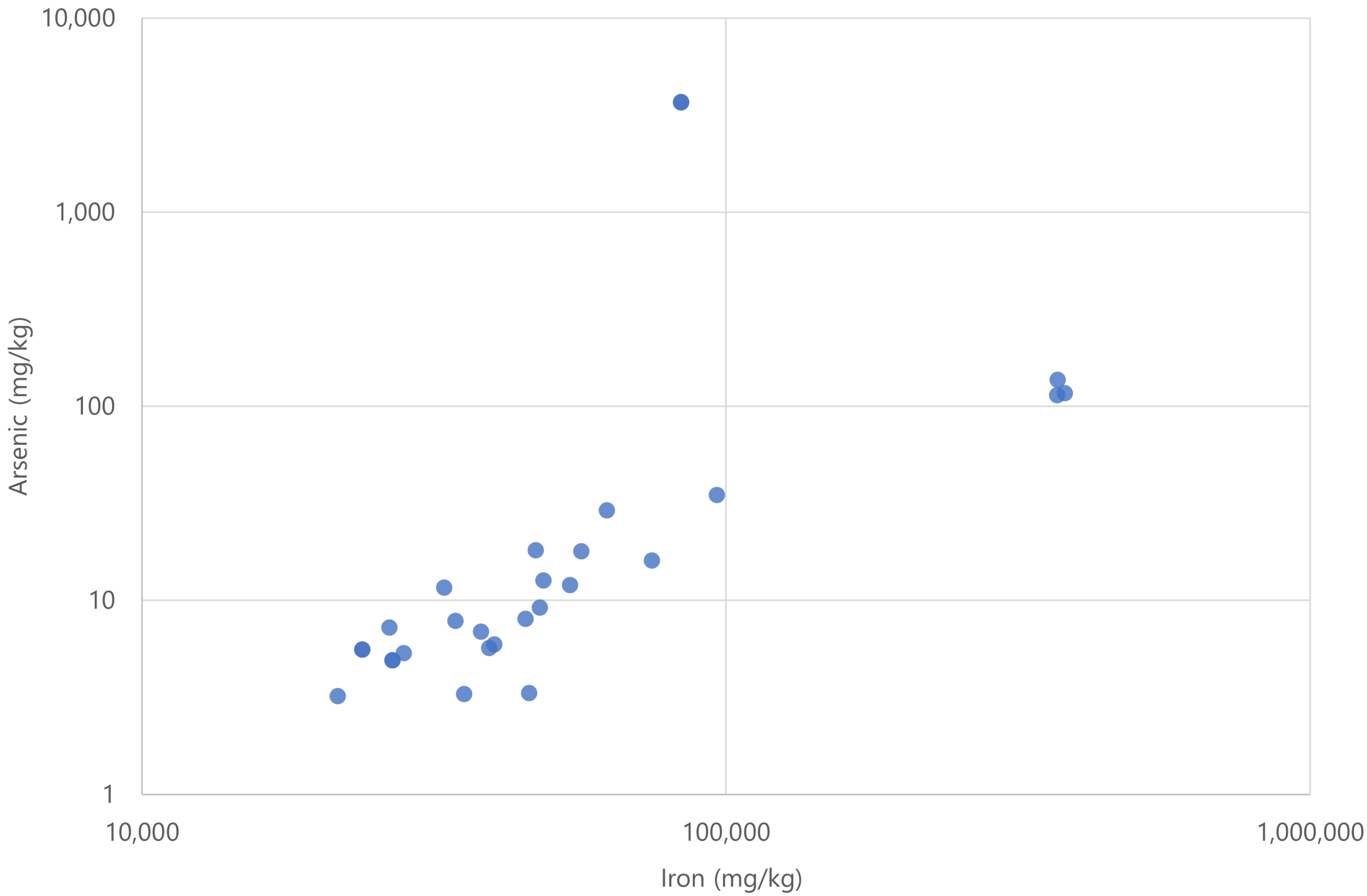
Figure 6
1D Model Transects
Monitored Natural Attenuation Demonstration
Plant Gadsden

Note:
Soil Sample from Monitoring Well GSD-AP-MW-2VB

Figure 7
Representative Soil Samples
Monitored Natural Attenuation Demonstration
Plant Gadsden



Note:
mg/kg: milligrams per kilogram

Filepath: \\Athena\Mobile\Projects\Southern Company\Alabama Power ACMs - PRIVILEGED & CONFIDENTIAL\MNA Demonstration Reports\Gadsden\Figures\Figure 8 - Bulk Chemistry Arsenic and Iron.docx

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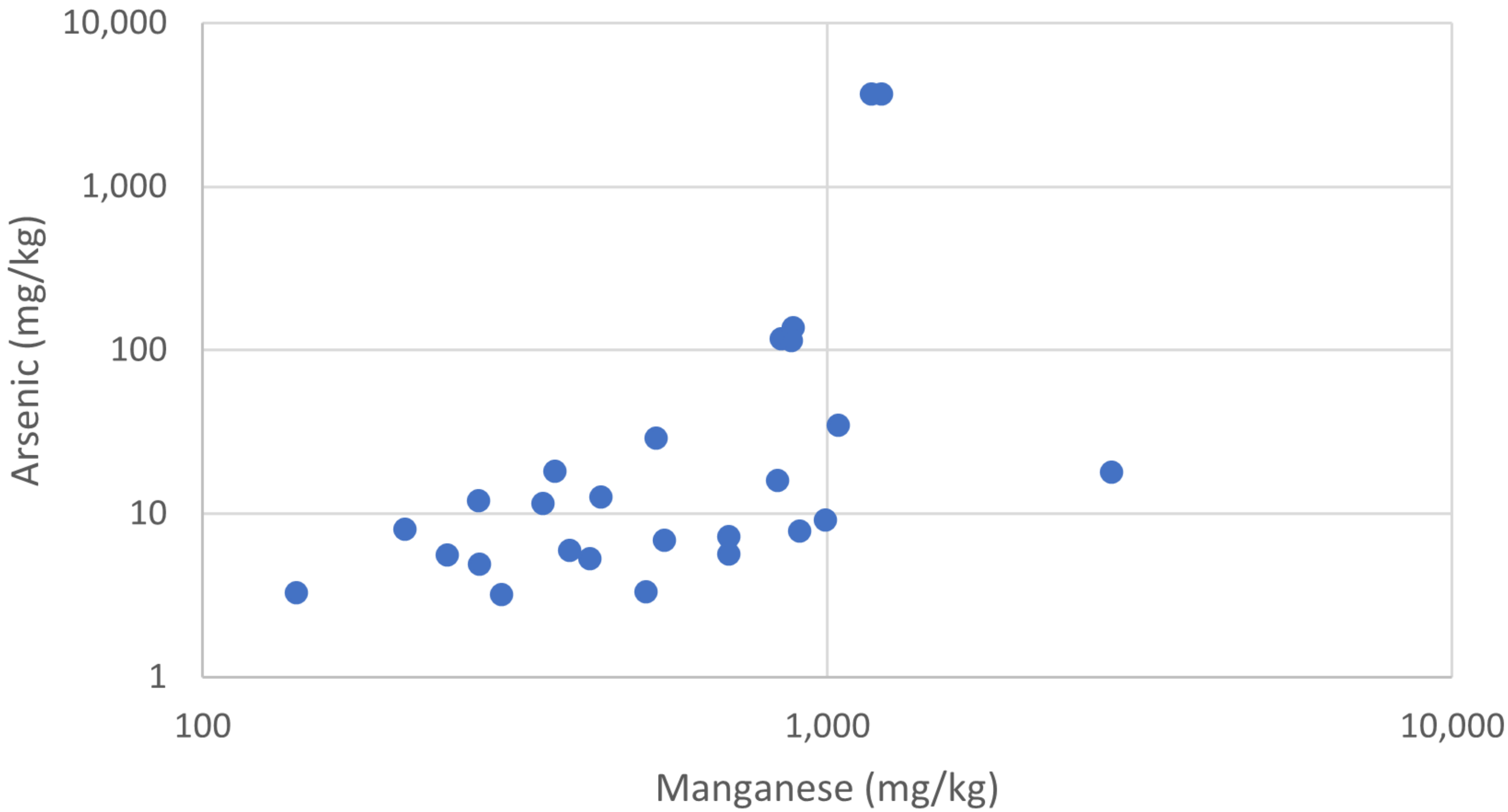
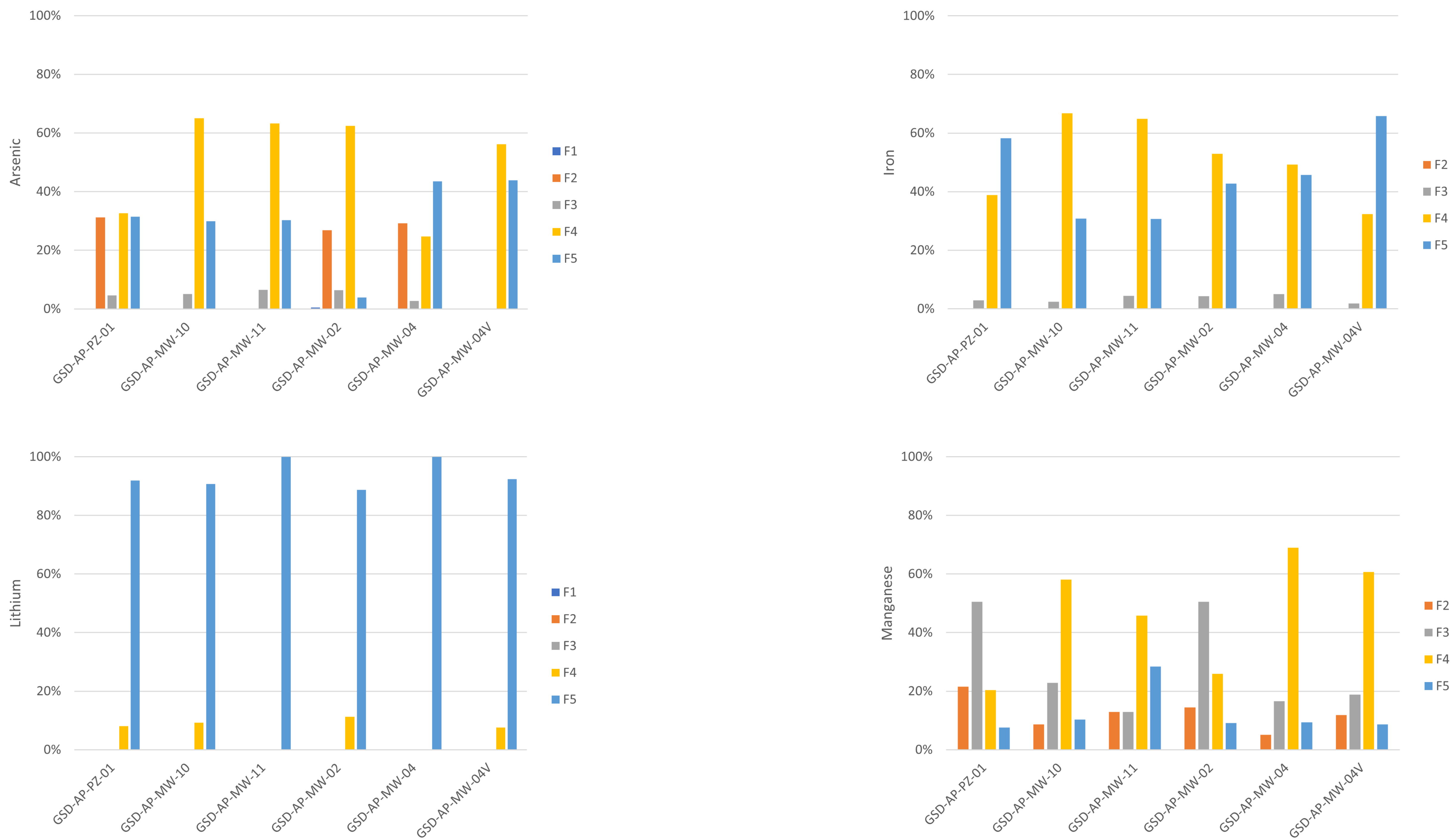
Figure 8
Bulk Chemistry Relationship Between Arsenic and Iron
Monitored Natural Attenuation Demonstration
Plant Gadsden



Note:
mg/kg: milligrams per kilogram

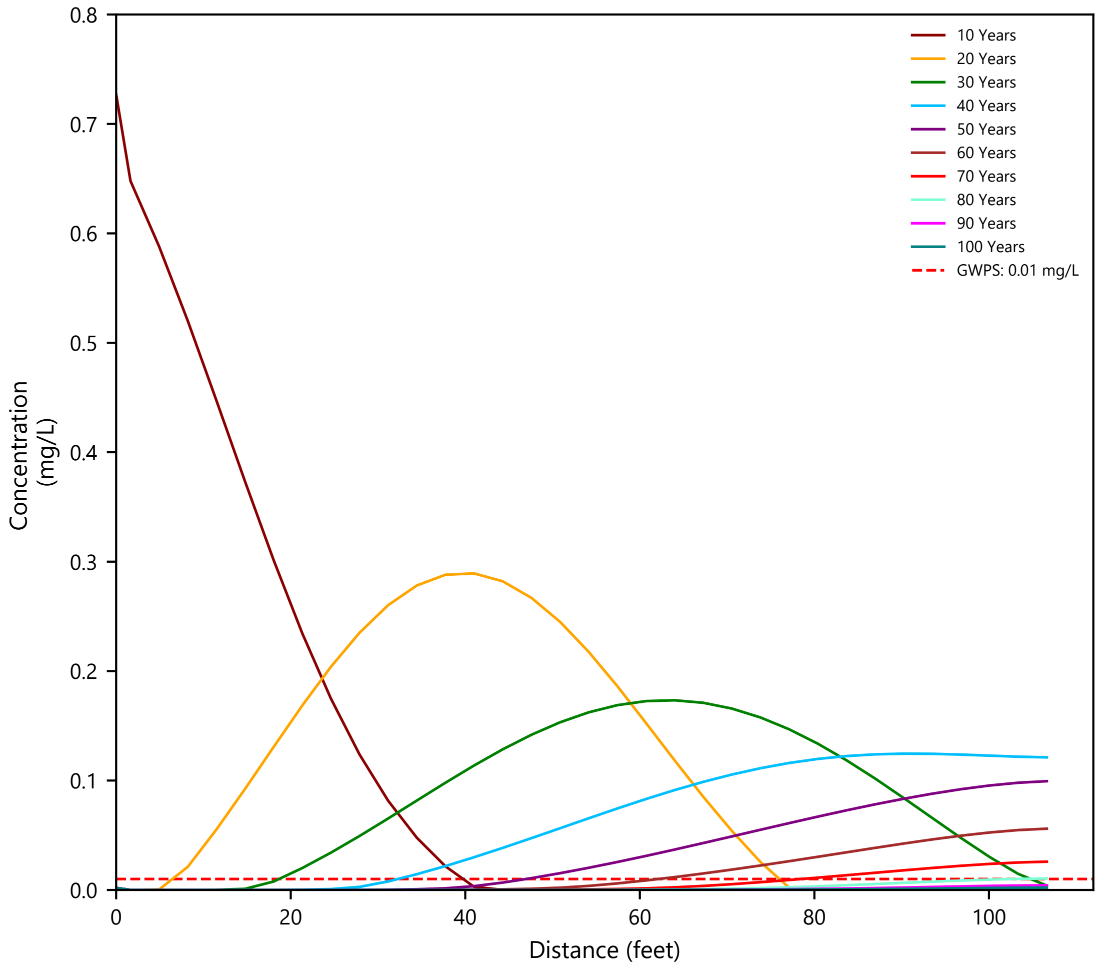
Filepath: \\Athena\Mobile\Projects\Southern Company\Alabama Power ACMs - PRIVILEGED & CONFIDENTIAL\MNA Demonstration Reports\Gadsden\Figures\Figure 9 - Bulk Chemistry Arsenic and Manganese.docx

Figure 9
Bulk Chemistry Relationship Between Arsenic and Manganese
Monitored Natural Attenuation Demonstration
Plant Gadsden



Notes:
F1: water soluble
F2: exchangeable (e.g., clay minerals)
F3: reducible (e.g., poorly crystalline metal oxides such as iron oxides)
F4: oxidizable (e.g., crystalline oxide and crystalline sulfide minerals)
F5: residual (e.g., silicate phases)
SSE: selective sequential extraction

Figure 10
SSE Results for Well Solids
Monitored Natural Attenuation Demonstration
Plant Gadsden



Notes:
Model reactions include surface complexation, cation exchange, and mineral precipitation.

GWPS: Groundwater Protection Standard
mg/L: Milligrams per Liter

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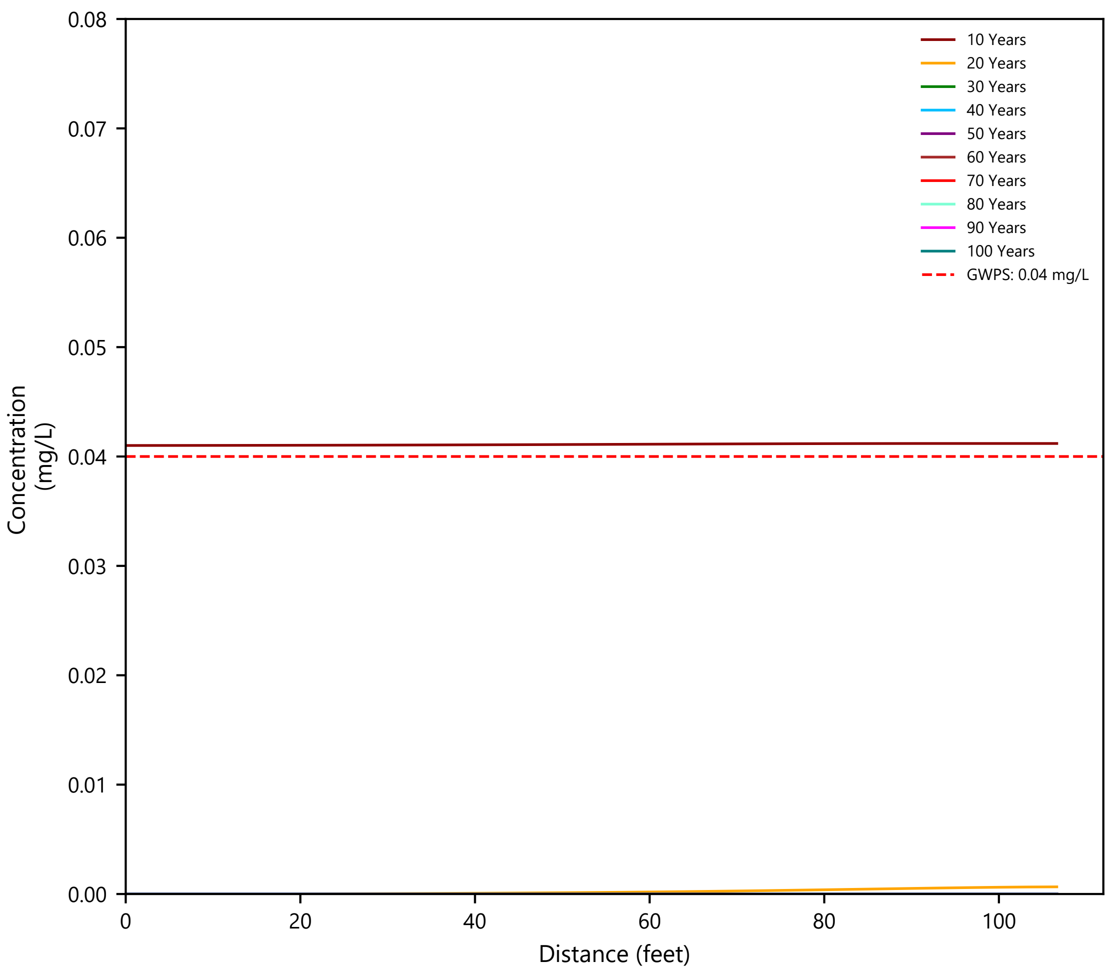
Figure 11a
Simulated Arsenic Concentrations Along Model Transect 1
Monitored Natural Attenuation Demonstration
Plant Gadsden



Notes:
Model reactions include surface complexation, cation exchange, and mineral precipitation.

GWPS: Groundwater Protection Standard
mg/L: Milligrams per Liter

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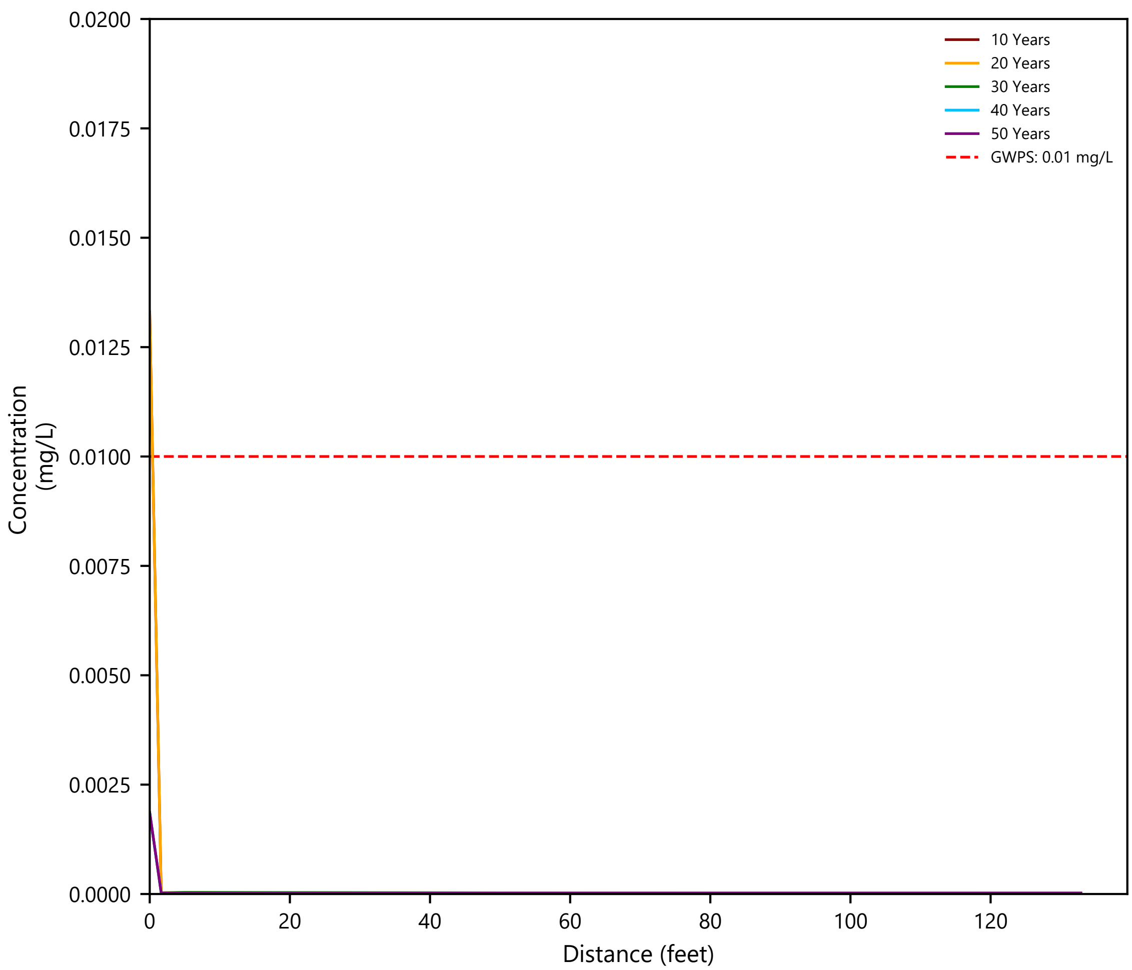
Figure 11b
Simulated Lithium Concentrations Along Model Transect 1
Monitored Natural Attenuation Demonstration
Plant Gadsden



Notes:
Model reactions include surface complexation, cation exchange, and mineral precipitation.

GWPS: Groundwater Protection Standard
mg/L: Milligrams per Liter

Figure 12
Simulated Arsenic Concentrations Along Model Transect 2
Monitored Natural Attenuation Demonstration
Plant Gadsden

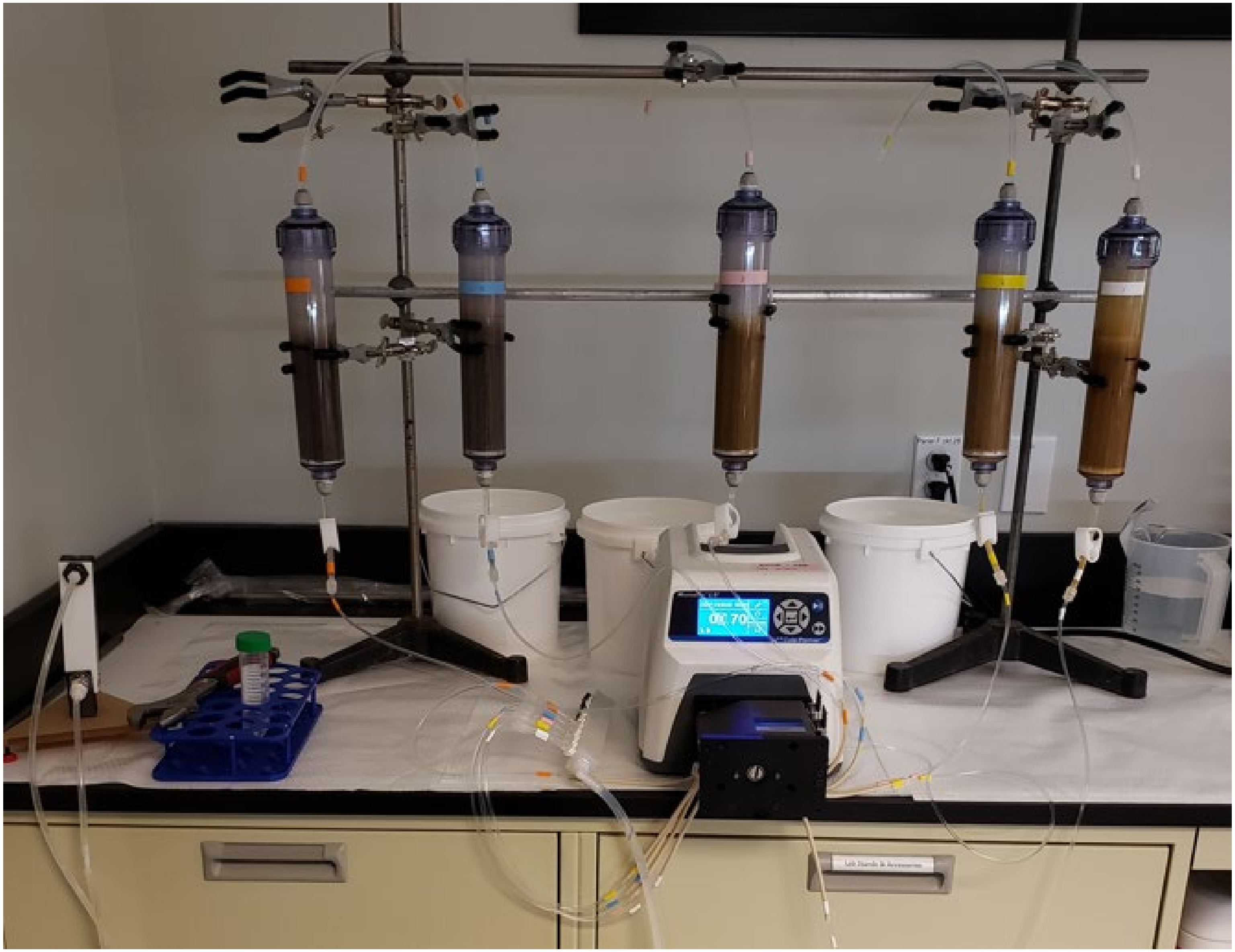


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Figure 13
Column Test Equipment Setup
Monitored Natural Attenuation Demonstration
Plant Gadsden

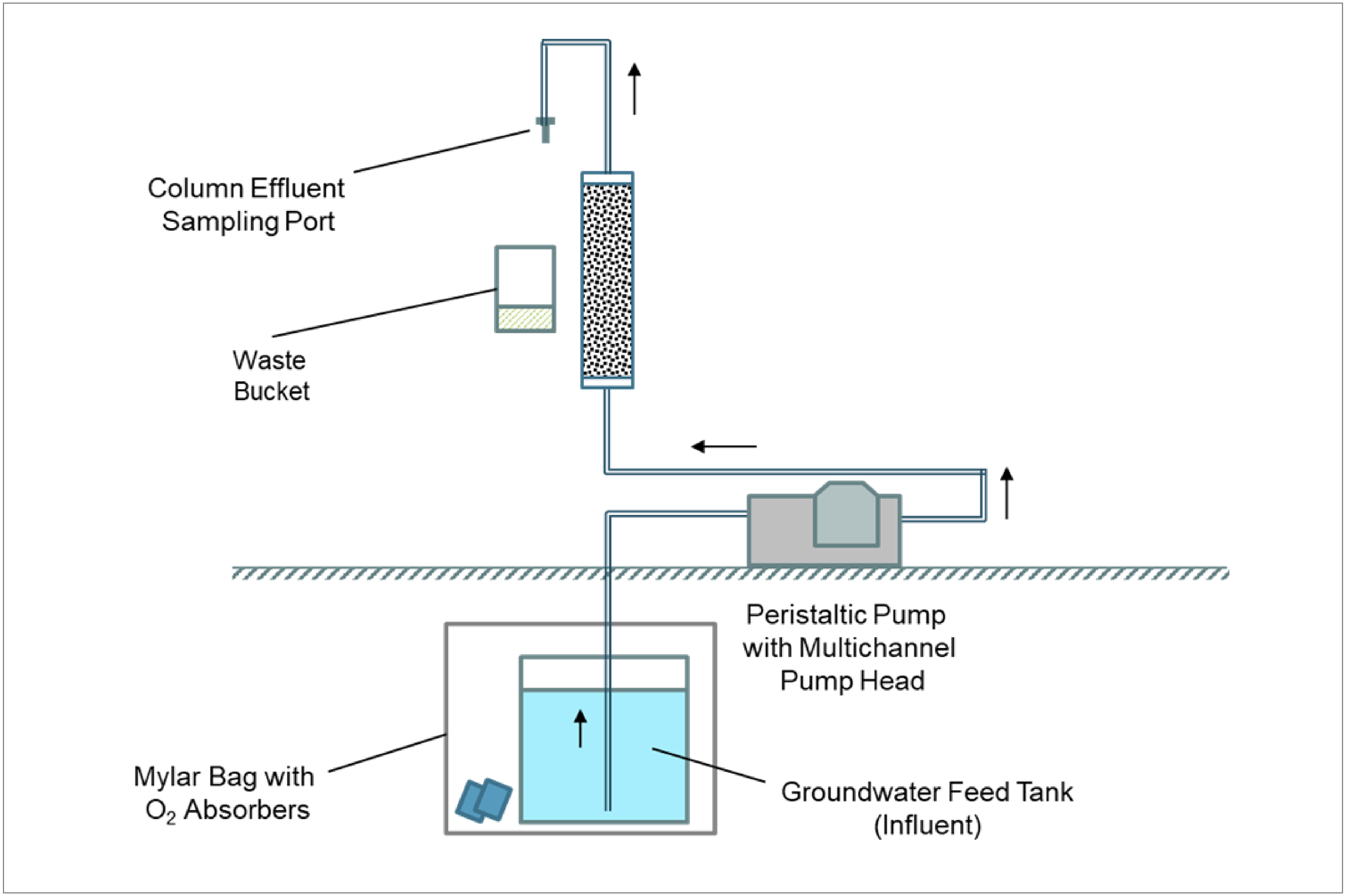

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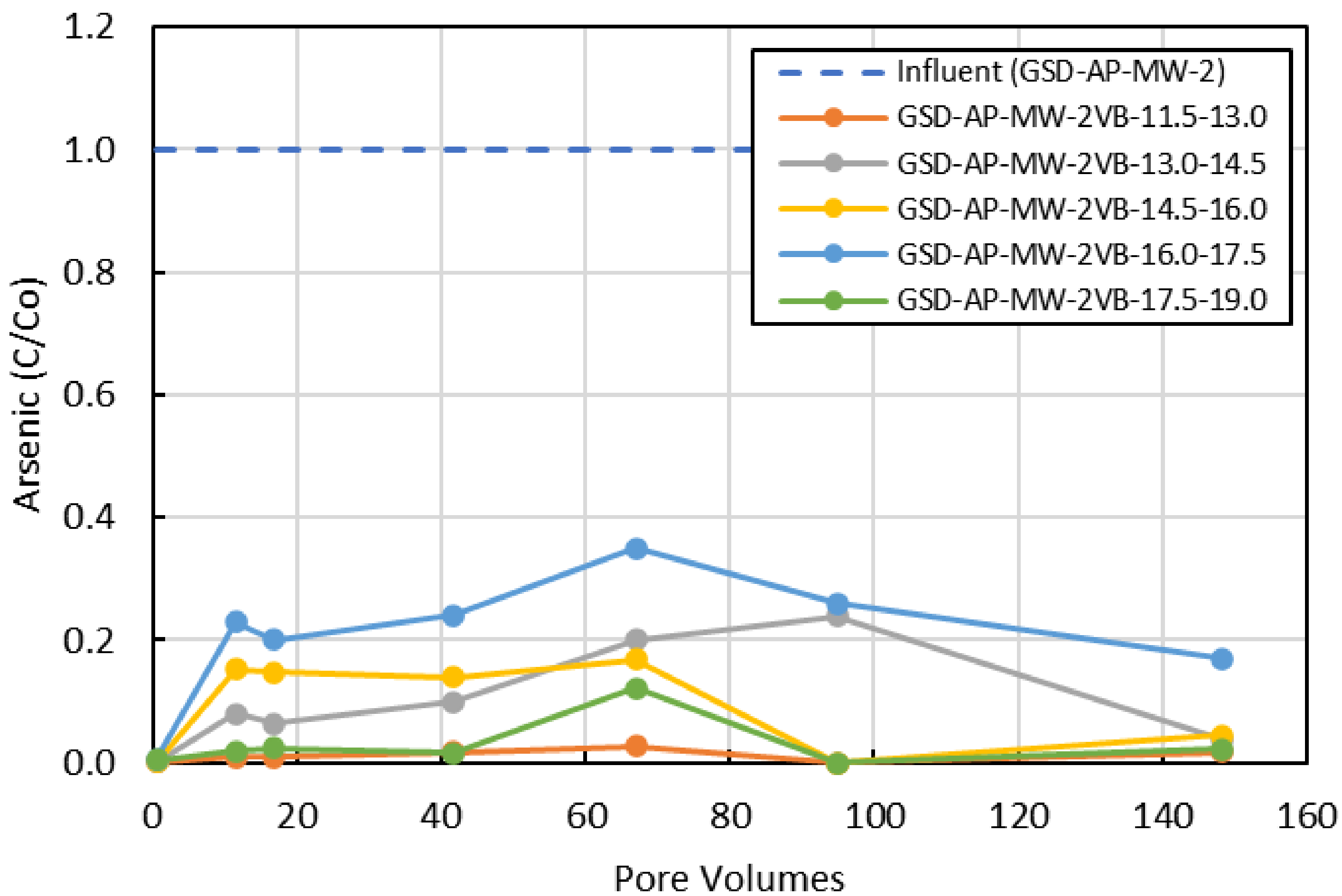
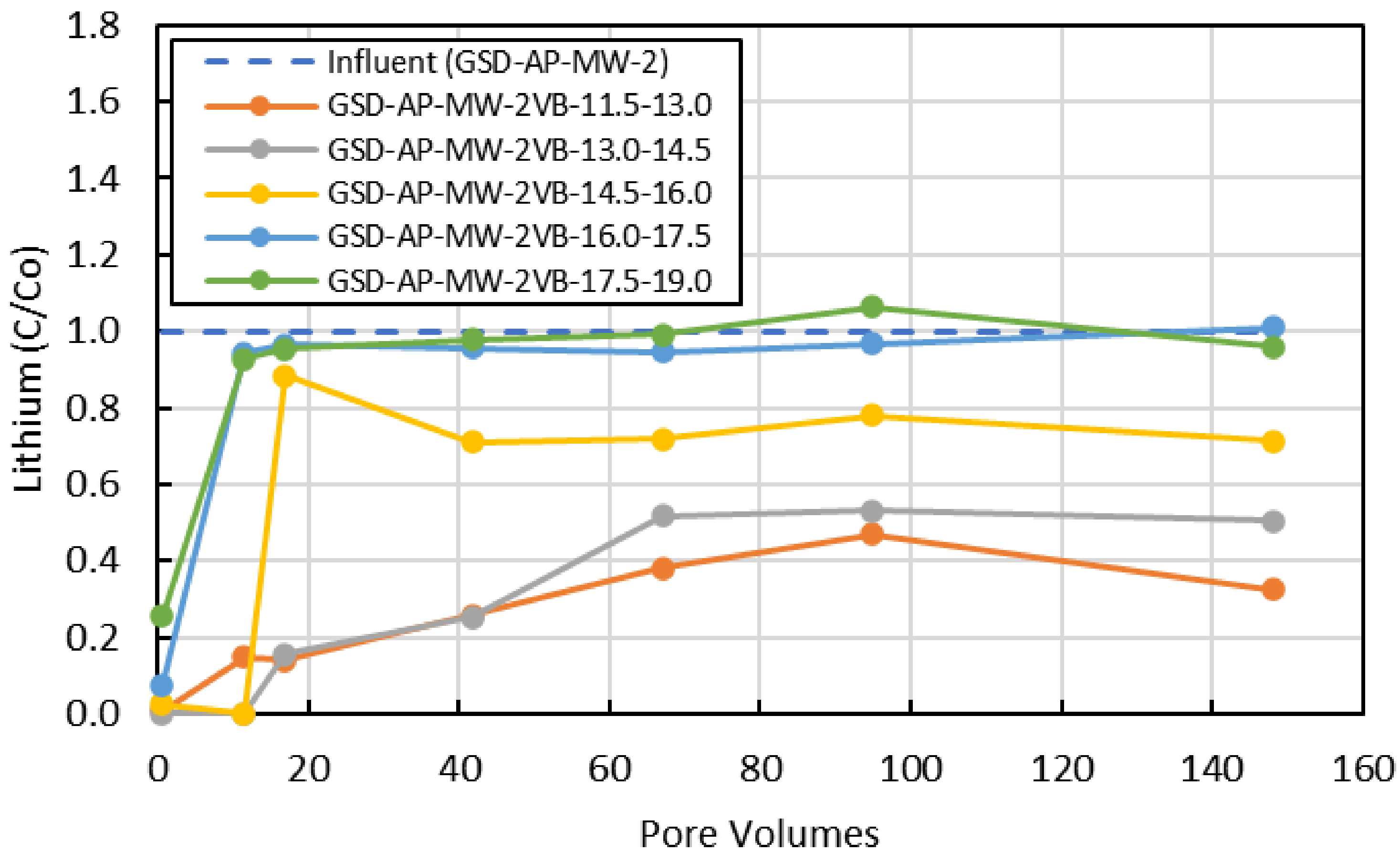
Figure 14
Schematic of Column Test Setup
Monitored Natural Attenuation Demonstration
Plant Gadsden



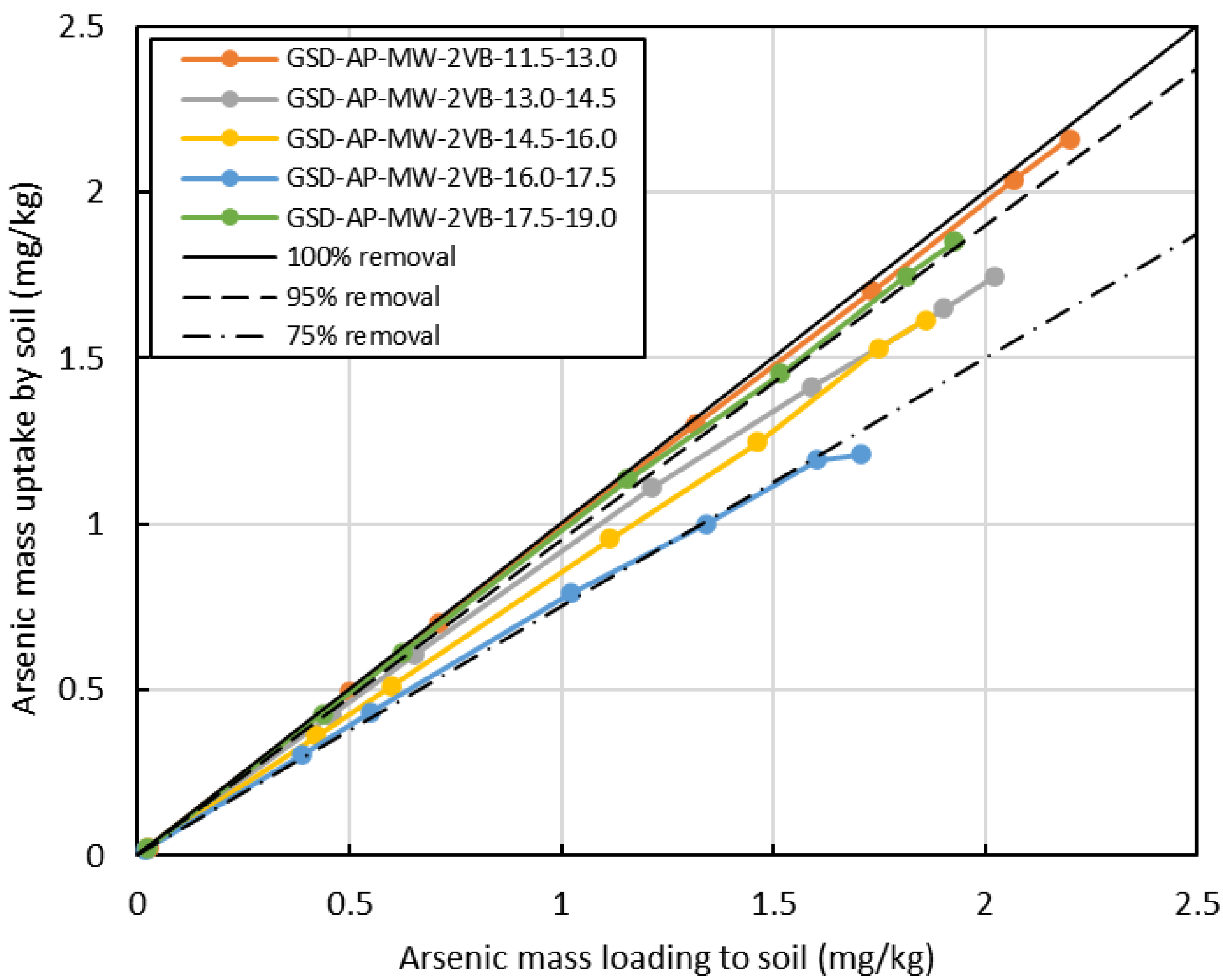
Notes:
Blue dashed line denotes effluent concentrations equal influent concentrations (i.e., arsenic removal capacity exceeded).
C/Co: ratio of concentration in column effluent to that in column influent solution

Figure 15
Dissolved Arsenic Breakthrough Curves
Monitored Natural Attenuation Demonstration
Plant Gadsden



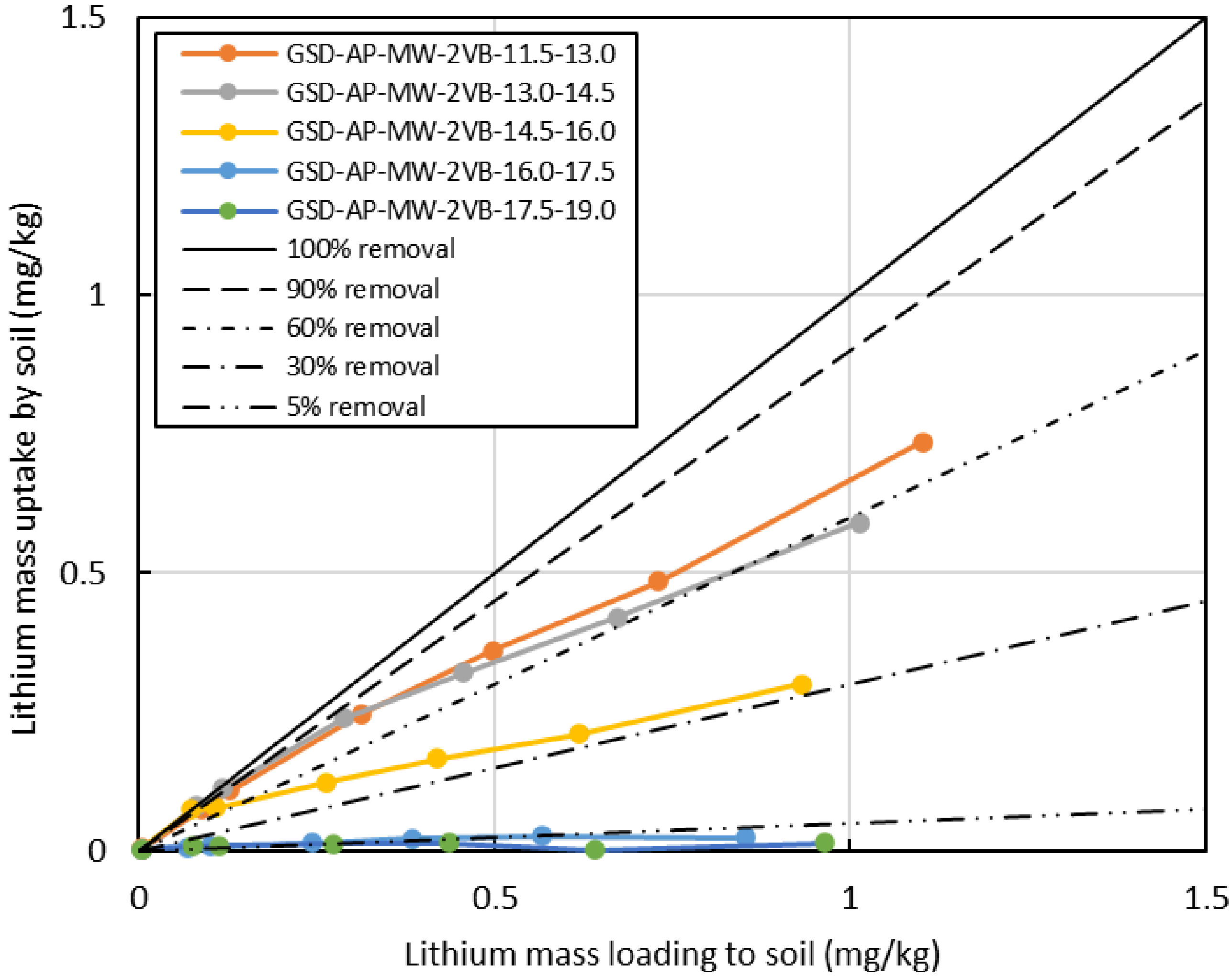
Notes:
Blue dashed line denotes effluent concentrations equal to influent concentrations (i.e., lithium removal capacity exceeded).
C/Co: ratio of column effluent concentration to that of column influent

Figure 16
Dissolved Lithium Breakthrough Curves
Monitored Natural Attenuation Demonstration
Plant Gadsden



Note:
mg/kg: milligrams per kilogram

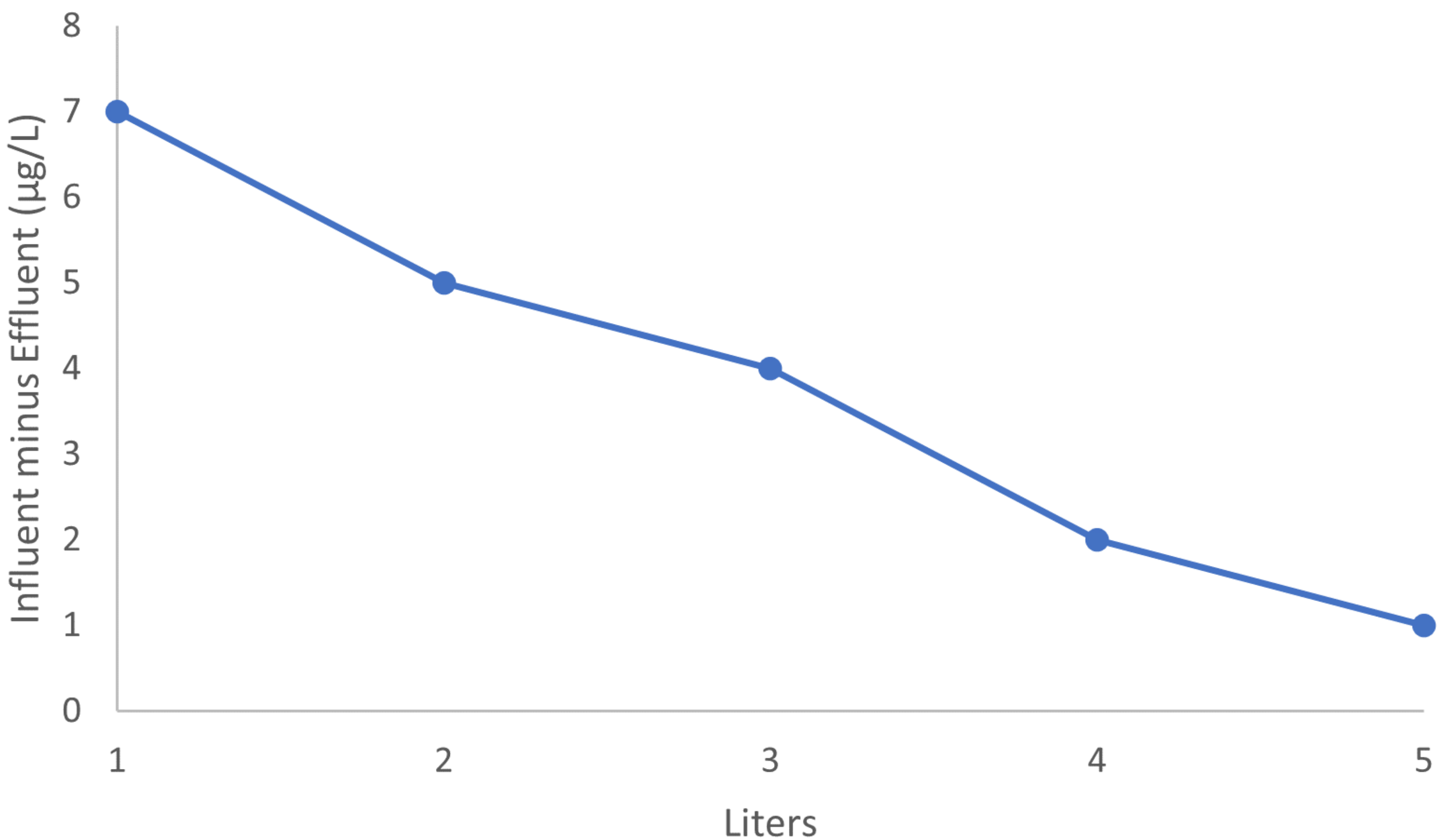
Figure 17
Cumulative Arsenic Removal by Soil Columns as a Function of Loading
Monitored Natural Attenuation Demonstration
Plant Gadsden



Note:
mg/kg: milligrams per kilogram

ANCHOR QEA

Figure 18
Cumulative Lithium Removal by Soil Columns as a Function of Loading
Monitored Natural Attenuation Demonstration
Plant Gadsden



Note:
µg/L: micrograms per liter

Filepath: \\Athena\Mobile\Projects\Southern Company\Alabama Power ACMs - PRIVILEGED & CONFIDENTIAL\MNA Demonstration Reports\Gadsden\Figures\Figure 19 - Example Attenuated Mass Graph.docx

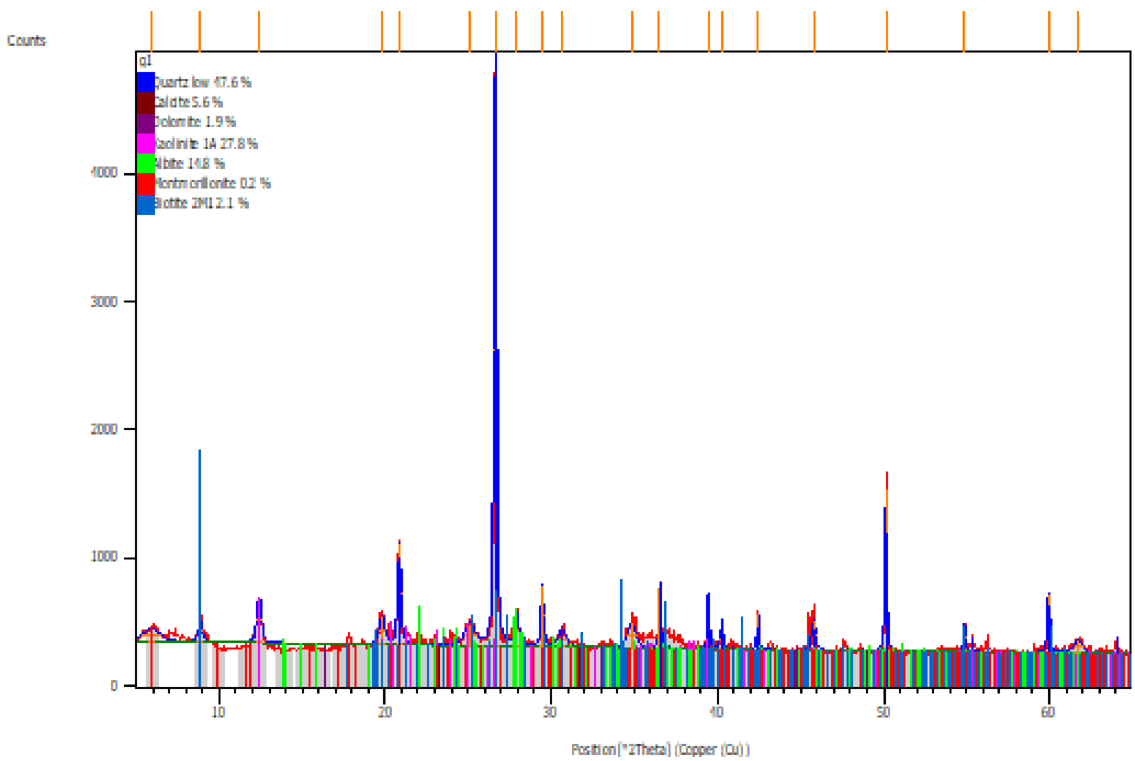
Figure 19
Example Graph to Calculate Mass Attenuated by Columns
Monitored Natural Attenuation Demonstration
Plant Gadsden

Appendix A
Analytical Data

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-004-1412	59	Quartz low	O2 Si1
98-003-7241	6	Calcite	C1 Ca1 O3
98-004-0971	14	Dolomite	C2 Ca1 Mg1 O6
98-008-0082	20	Kaolinite 1A	H4 Al2 O9 Si2
98-008-7654	15	Albite	Al1 Na1 O8 Si3
98-016-1171	21	Montmorillonite	H1 Al2 Ca0.5 O12 Si4
98-015-9336	16	Biotite 2M1	H2.548 Al2.432 Fe2..

Graphics

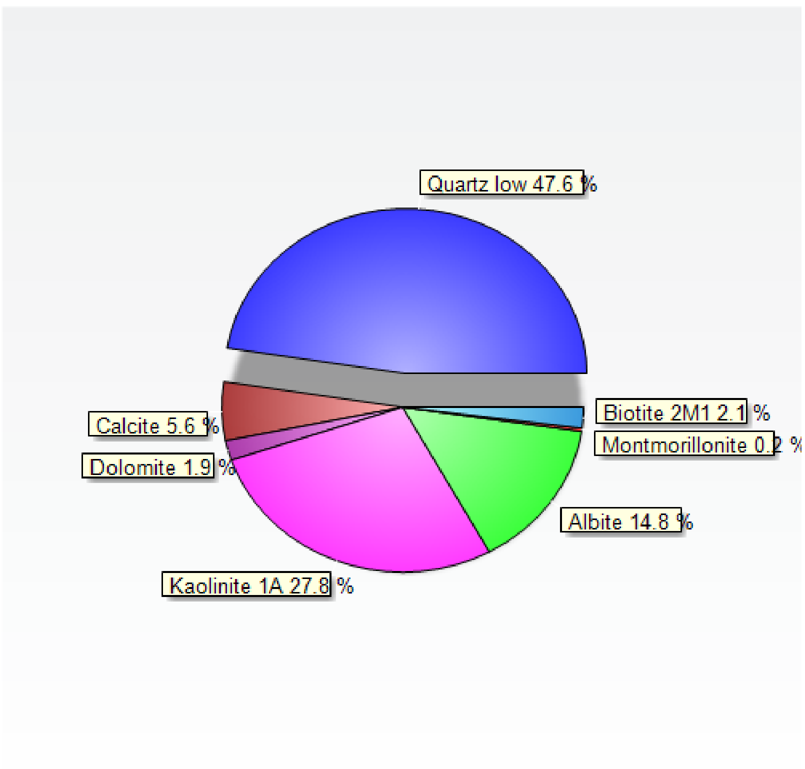


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
5.9442	14.85643	2.12	98-016-1171
8.8923	9.93649	3.58	98-015-9336
12.4245	7.11845	7.57	98-008-0082
19.8173	4.47646	4.82	98-008-0082;98..
20.8601	4.25496	16.62	98-004-1412;98..
25.0980	3.54528	3.55	98-008-0082;98..
26.6404	3.34342	100.00	98-004-1412;98..
27.9449	3.19023	5.18	98-008-0082;98..
29.4660	3.02892	10.18	98-003-7241;98..
30.6690	2.91279	2.83	98-004-0971;98..

34.8406	2.57299	4.05	98-004-0971;98..
36.5369	2.45733	9.92	98-004-1412;98..
39.4599	2.28178	9.17	98-004-1412;98..
40.2661	2.23793	3.37	98-004-1412;98..
42.4504	2.12769	5.93	98-004-1412;98..
45.8187	1.97881	4.87	98-004-1412;98..
50.1495	1.81760	26.75	98-004-1412;98..
54.8894	1.67132	4.48	98-004-1412;98..
59.9411	1.54197	9.65	98-004-1412;98..
61.7213	1.50170	1.98	98-003-7241;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	48
Phase Calcite:	Weight fraction/ %:	6
Phase Dolomite:	Weight fraction/ %:	2
Phase Kaolinite 1A:	Weight fraction/ %:	28
Phase Albite:	Weight fraction/ %:	15
Phase Montmorillonite:	Weight fraction/ %:	0.2
Phase Biotite 2M1:	Weight fraction/ %:	2

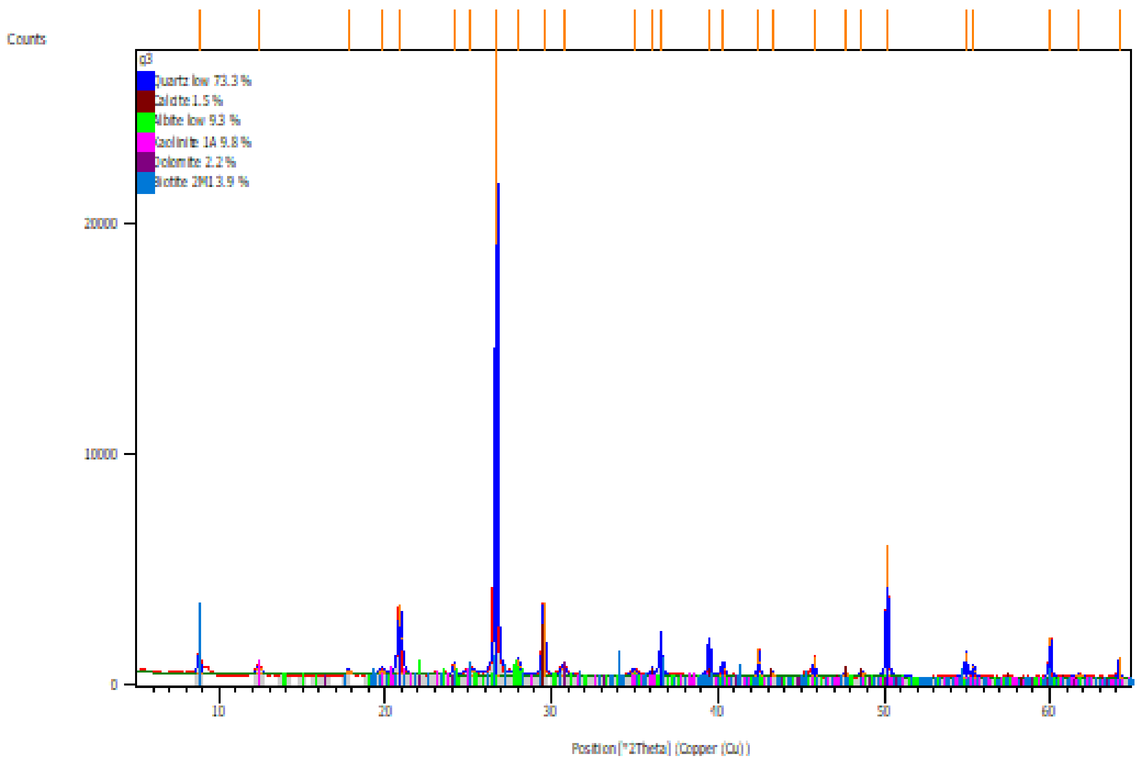
Anchor Scan Parameters

Dataset Name:	g1
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\g1.rd
Sample Identification:	GSD-AP-MW-02
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/28/2021 3:15:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	0.5000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-002-7826	73	Quartz low	O2 Si1
98-003-7241	36	Calcite	C1 Ca1 O3
98-010-0338	16	Albite low	Al1.005 Na0.986 O8..
98-008-0082	21	Kaolinite 1A	H4 Al2 O9 Si2
98-017-1524	18	Dolomite	C2 Ca1 Mg1 O6
98-015-9336	24	Biotite 2M1	H2.548 Al2.432 Fe2..

Graphics

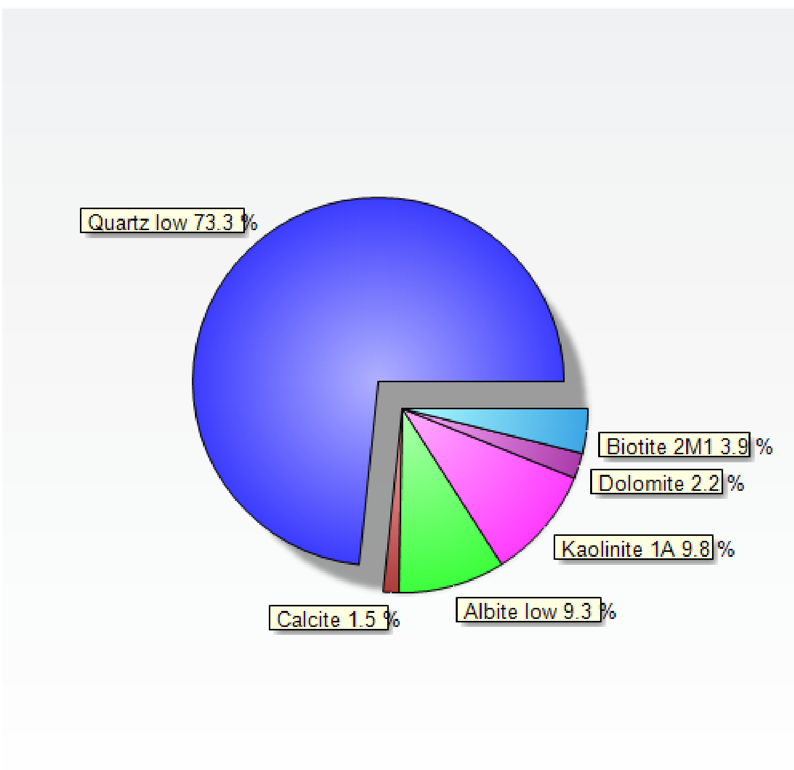


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
8.7968	10.04419	3.53	98-015-9336
12.3903	7.13801	1.31	98-008-0082
17.8084	4.97663	0.87	98-015-9336
19.8058	4.47903	0.96	98-008-0082;98..
20.8832	4.25033	11.28	98-002-7826
24.1591	3.68089	1.92	98-010-0338;98..
25.0906	3.54631	1.00	98-008-0082;98..
26.7001	3.33607	100.00	98-002-7826;98..
28.0133	3.18261	2.72	98-010-0338;98..
29.5327	3.02222	11.73	98-003-7241;98..
30.7234	2.90776	1.88	98-010-0338;98..

34.9624	2.56431	0.96	98-010-0338;98..
36.0541	2.48912	1.25	98-003-7241;98..
36.5787	2.45462	4.42	98-002-7826;98..
39.4886	2.28018	6.02	98-002-7826;98..
40.3355	2.23424	2.26	98-002-7826;98..
42.4805	2.12626	4.34	98-002-7826;98..
43.2942	2.08816	0.72	98-003-7241;98..
45.8262	1.97850	3.23	98-002-7826;98..
47.6509	1.90691	1.00	98-003-7241;98..
48.6863	1.86875	0.75	98-003-7241;98..
50.2053	1.81571	21.12	98-002-7826;98..
54.9483	1.66967	4.09	98-002-7826;98..
55.3816	1.65763	1.93	98-002-7826;98..
60.0255	1.54001	6.50	98-002-7826;98..
61.7110	1.50192	0.52	98-003-7241;98..
64.1484	1.45061	3.22	98-002-7826;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	73
Phase Calcite:	Weight fraction/ %:	1.5
Phase Albite low:	Weight fraction/ %:	9
Phase Kaolinite 1A:	Weight fraction/ %:	10
Phase Dolomite:	Weight fraction/ %:	2
Phase Biotite 2M1:	Weight fraction/ %:	4

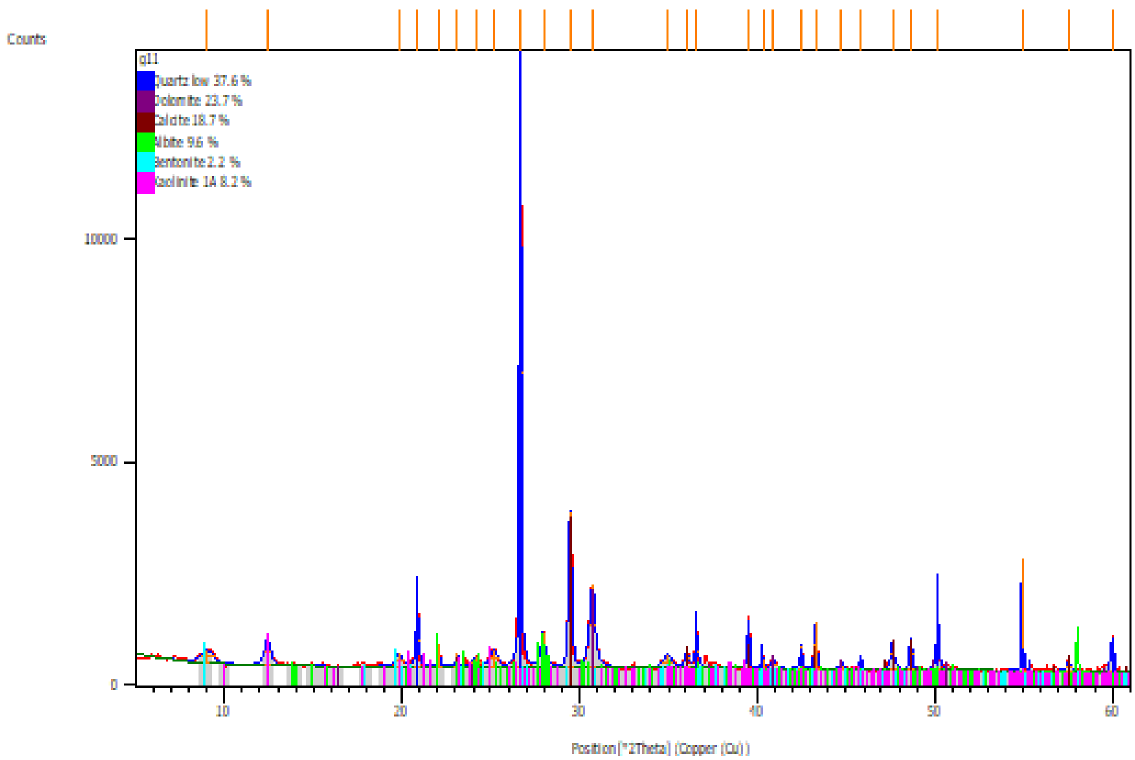
Anchor Scan Parameters

Dataset Name:	g3
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\g3.rd
Sample Identification:	GSD-AP-PZ-01
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/27/2021 5:10:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-008-3849	49	Quartz low	O2 Si1
98-004-0971	42	Dolomite	C2 Ca1 Mg1 O6
98-003-7241	48	Calcite	C1 Ca1 O3
98-008-7654	36	Albite	Al1 Na1 O8 Si3
98-016-0437	26	Bentonite	H2 Al1.93 Ca0.06 F..
98-006-8698	34	Kaolinite 1A	H4 Al2 O9 Si2

Graphics

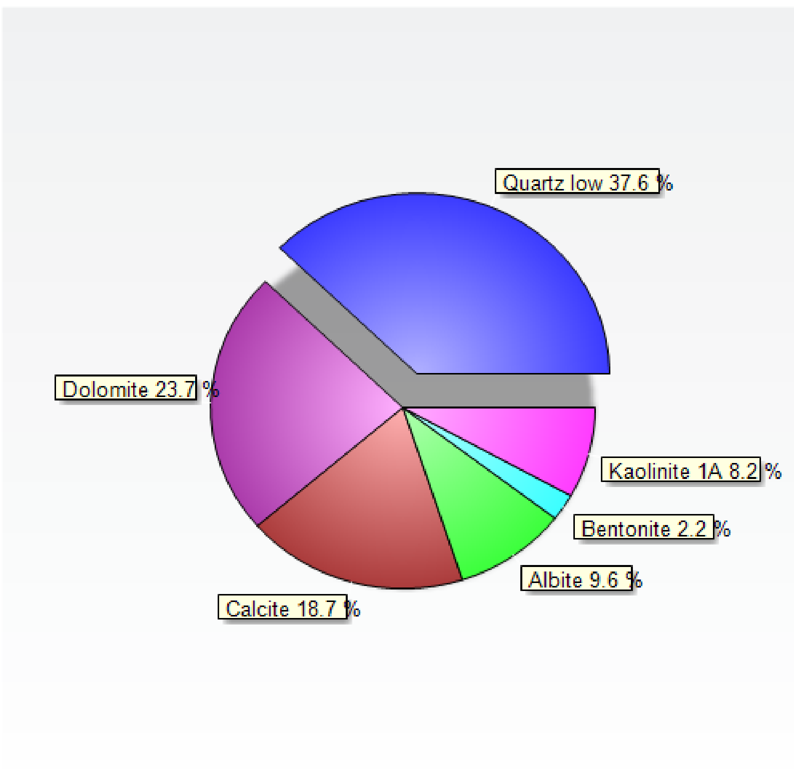


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
9.02(2)	9.80030	2.09	98-016-0437
12.423(7)	7.11907	4.41	98-006-8698
19.82(1)	4.47637	2.32	98-016-0437;98..
20.865(3)	4.25407	9.09	98-008-3849
22.080(3)	4.02255	4.23	98-004-0971;98..
23.102(7)	3.84681	2.37	98-003-7241;98..
24.15(2)	3.68214	1.61	98-004-0971;98..
25.16(1)	3.53657	2.92	98-008-7654;98..
26.6660(5)	3.34026	100.00	98-008-3849;98..
27.953(5)	3.18934	5.89	98-008-7654;98..
29.468(1)	3.02870	26.57	98-003-7241;98..

30.718(3)	2.90821	14.07	98-004-0971;98..
34.96(1)	2.56429	2.13	98-004-0971;98..
36.046(8)	2.48964	3.01	98-003-7241;98..
36.596(4)	2.45347	5.88	98-008-3849;98..
39.511(2)	2.27894	8.41	98-008-3849;98..
40.33(1)	2.23460	1.68	98-008-3849;98..
40.92(2)	2.20347	1.33	98-004-0971;98..
42.486(4)	2.12598	4.18	98-008-3849;98..
43.300(3)	2.08788	7.89	98-003-7241;98..
44.76(1)	2.02305	1.16	98-004-0971;98..
45.830(7)	1.97835	2.12	98-008-3849;98..
47.630(4)	1.90771	5.03	98-003-7241;98..
48.659(3)	1.86973	5.25	98-003-7241;98..
50.178(2)	1.81665	8.90	98-008-3849;98..
54.9464(9)	1.66972	19.18	98-008-3849;98..
57.55(1)	1.60010	1.92	98-008-3849;98..
60.013(3)	1.54029	5.77	98-008-3849;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	38
Phase Dolomite:	Weight fraction/ %:	24
Phase Calcite:	Weight fraction/ %:	19
Phase Albite:	Weight fraction/ %:	10
Phase Bentonite:	Weight fraction/ %:	2
Phase Kaolinite 1A:	Weight fraction/ %:	8

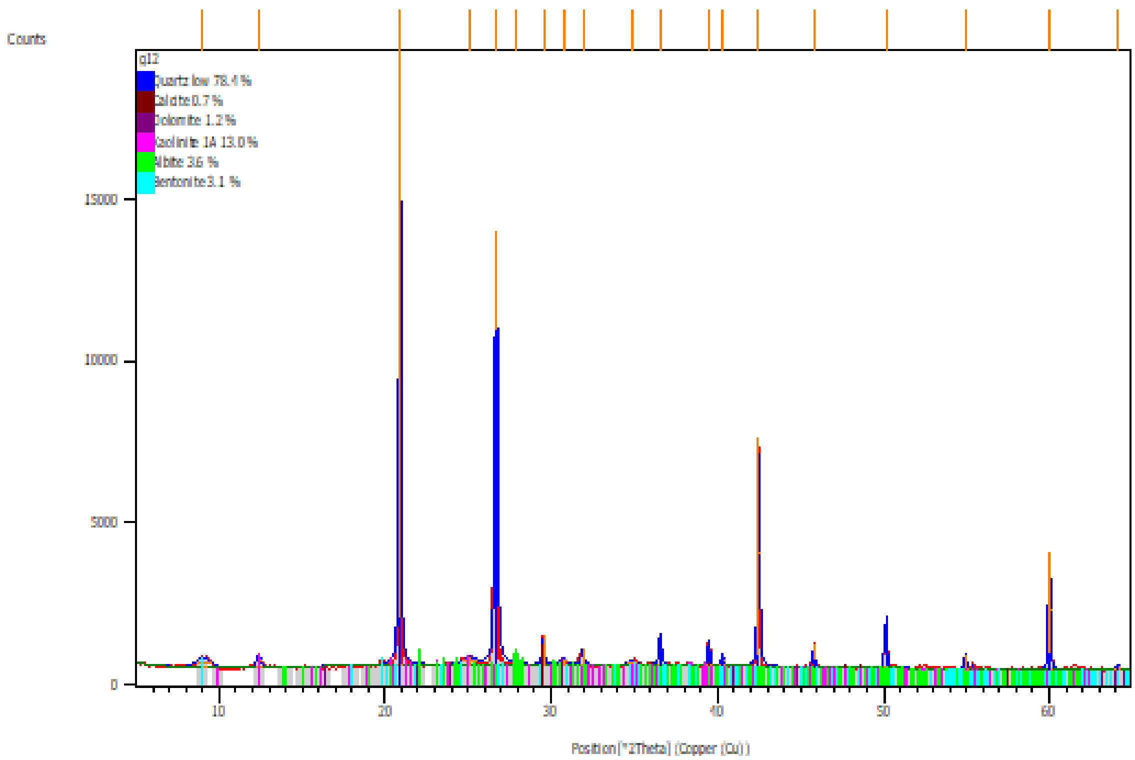
Anchor Scan Parameters

Dataset Name:	g11
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\g11.rd
Sample Identification:	GSD-AP-MW-04V
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/27/2021 3:23:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	61.1000
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-008-3849	65	Quartz low	O2 Si1
98-003-7241	11	Calcite	C1 Ca1 O3
98-004-0971	16	Dolomite	C2 Ca1 Mg1 O6
98-006-8698	14	Kaolinite 1A	H4 Al2 O9 Si2
98-008-7654	7	Albite	Al1 Na1 O8 Si3
98-016-0437	17	Bentonite	H2 Al1.93 Ca0.06 F..

Graphics

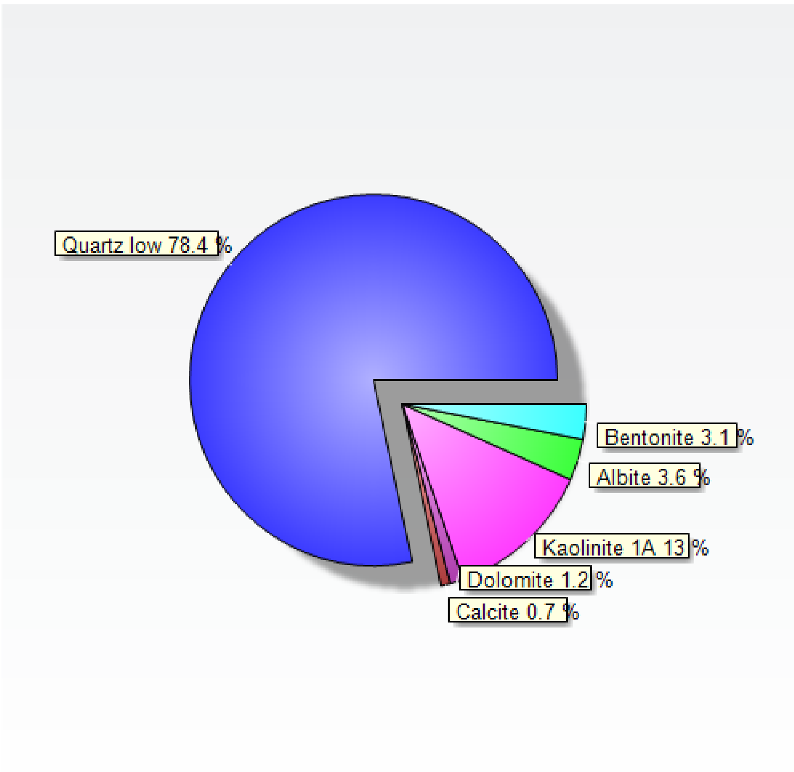


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
9.0614	9.75147	1.48	98-016-0437
12.3871	7.13987	2.07	98-006-8698
20.8852	4.24992	100.00	98-008-3849
25.0425	3.55301	0.95	98-006-8698
26.6856	3.33785	67.62	98-008-3849;98..
27.9246	3.19251	1.28	98-006-8698;98..
29.5121	3.02429	4.39	98-003-7241;98..
30.7433	2.90592	0.97	98-004-0971;98..
31.8987	2.80325	2.45	98-006-8698;98..
34.8591	2.57167	0.62	98-004-0971;98..
36.5677	2.45534	4.49	98-008-3849;98..

39.4867	2.28029	3.92	98-008-3849;98..
40.3178	2.23518	1.59	98-008-3849;98..
42.4872	2.12594	35.32	98-008-3849;98..
45.8092	1.97919	3.67	98-008-3849;98..
50.1392	1.81795	7.13	98-008-3849;98..
54.9317	1.67013	2.29	98-008-3849;98..
59.9922	1.54078	18.48	98-008-3849;98..
64.0926	1.45174	0.90	98-008-3849;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	78
Phase Calcite:	Weight fraction/ %:	0.7
Phase Dolomite:	Weight fraction/ %:	1
Phase Kaolinite 1A:	Weight fraction/ %:	13
Phase Albite:	Weight fraction/ %:	4
Phase Bentonite:	Weight fraction/ %:	3

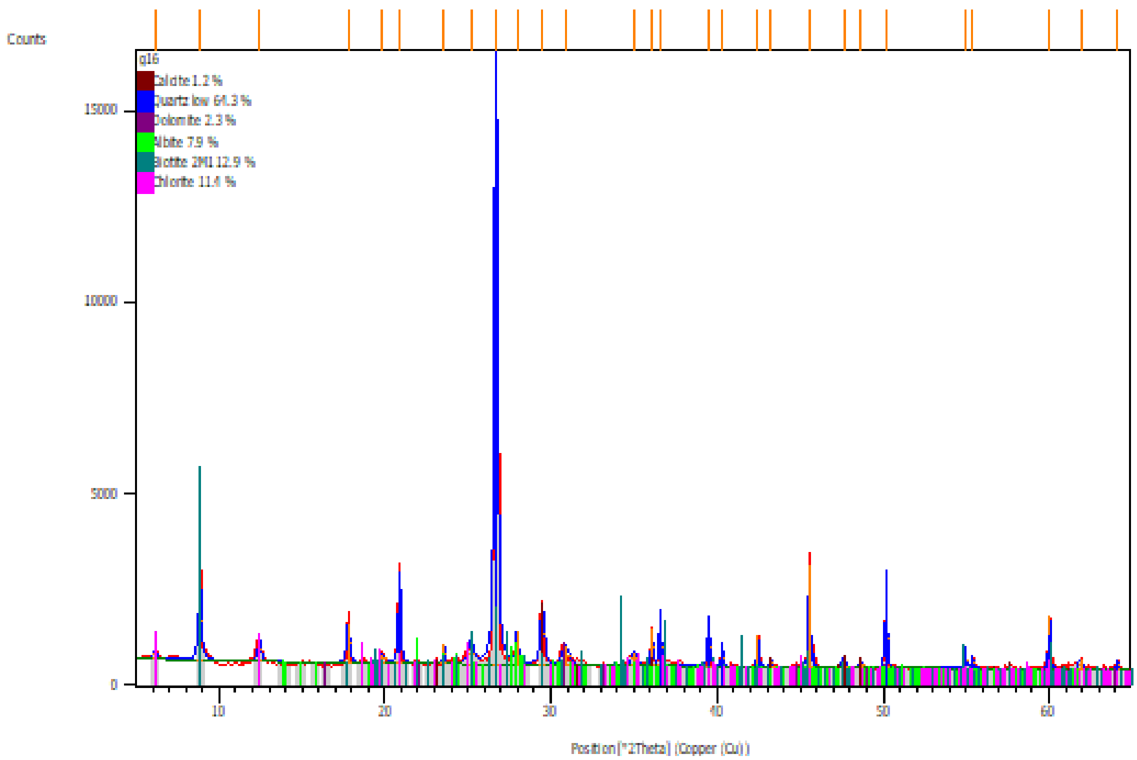
Anchor Scan Parameters

Dataset Name:	g12
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\g12.rd
Sample Identification:	GSD-AP-MW-04
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/27/2021 1:29:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-003-7241	28	Calcite	C1 Ca1 O3
98-008-3849	62	Quartz low	O2 Si1
98-004-0971	11	Dolomite	C2 Ca1 Mg1 O6
98-008-7654	14	Albite	Al1 Na1 O8 Si3
98-015-9336	28	Biotite 2M1	H2.548 Al2.432 Fe2..
96-901-0164	Unmatch	Chlorite	Mg9.17 Fe1.02 Al3...

Graphics

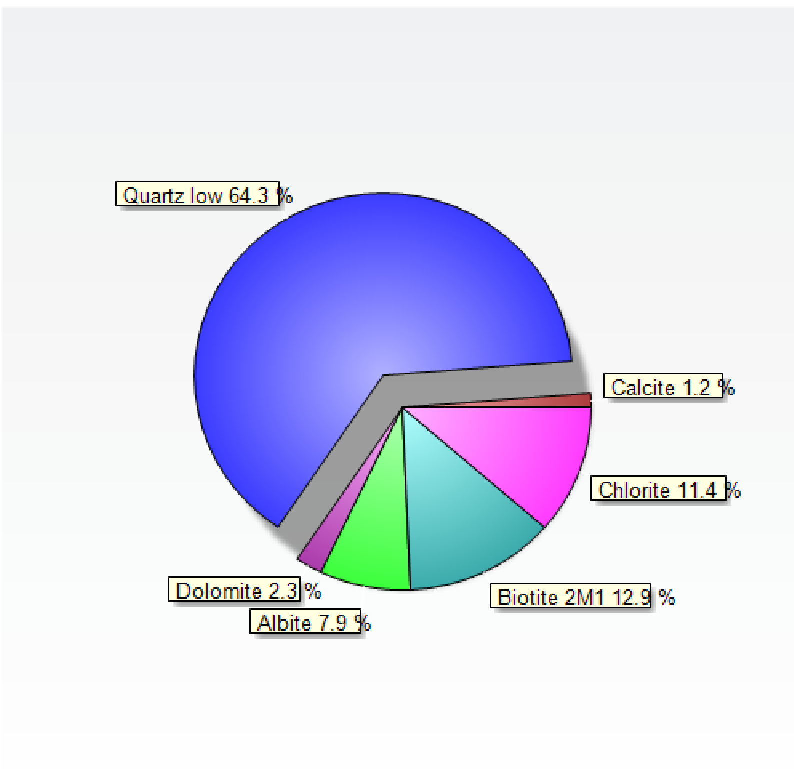


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
6.1727	14.30689	1.63	96-901-0164
8.8702	9.96123	13.11	98-015-9336
12.4587	7.09895	3.65	96-901-0164
17.7914	4.98137	6.45	98-015-9336
19.8556	4.46791	1.37	98-015-9336
20.8887	4.24922	14.31	98-008-3849;98..
23.5548	3.77395	3.06	98-008-7654;98..
25.1857	3.53313	3.45	98-008-7654;98..
26.6959	3.33659	100.00	98-008-3849;98..
27.9644	3.18806	5.37	98-008-7654
29.4811	3.02739	9.72	98-003-7241;98..

30.8808	2.89329	3.16	98-004-0971;98..
35.0097	2.56095	2.31	98-004-0971;98..
36.0831	2.48719	6.19	98-003-7241;98..
36.5790	2.45460	6.05	98-008-3849;98..
39.5036	2.27936	6.06	98-003-7241;98..
40.3322	2.23442	2.88	98-008-3849;98..
42.4770	2.12642	5.00	98-008-3849;98..
43.2508	2.09015	1.37	98-003-7241;98..
45.5591	1.98948	16.77	98-008-7654;98..
47.6174	1.90817	1.78	98-003-7241;98..
48.6602	1.86969	0.99	98-003-7241;98..
50.1853	1.81638	9.71	98-008-3849;98..
54.9368	1.66999	2.81	98-008-3849;98..
55.3753	1.65780	2.05	98-008-3849;98..
60.0265	1.53998	8.65	98-008-3849;98..
61.8953	1.49789	1.75	98-008-7654;98..
64.1142	1.45130	1.55	98-008-3849;98..

Quantitative Results



Phase Calcite:	Weight fraction/ %:	1.2
Phase Quartz low:	Weight fraction/ %:	64
Phase Dolomite:	Weight fraction/ %:	2.3
Phase Albite:	Weight fraction/ %:	8
Phase Biotite 2M1:	Weight fraction/ %:	13
Phase Chlorite:	Weight fraction/ %:	11

Anchor Scan Parameters

Dataset Name:	g16
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\g16.rd
Sample Identification:	GSD-AP-MW-10(2)
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/27/2021 11:34:00 AM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-006-2405	61	Quartz low	O2 Si1
98-007-5952	26	Muscovite 3T (Si-r..	H2 Al2.2 Fe0.25 K0..
98-008-7654	17	Albite	Al1 Na1 O8 Si3
96-901-0164	22	Chlorite	Mg9.17 Fe1.02 Al3...

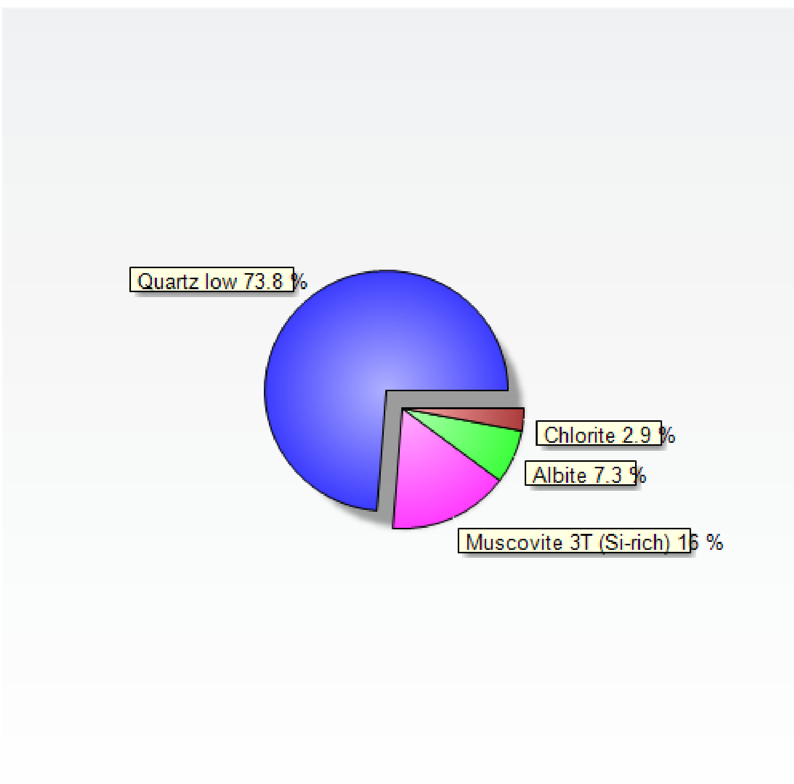
Graphics

Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
6.1817	14.28610	1.36	96-901-0164
8.9044	9.92304	17.40	98-007-5952
10.4786	8.43559	1.04	
12.4566	7.10015	2.17	96-901-0164
13.9094	6.36167	1.05	98-008-7654
17.8250	4.97205	9.33	98-007-5952
19.2700	4.60236	4.49	98-008-7654;96..
19.7894	4.48271	1.05	98-007-5952;96..
20.8883	4.24929	13.00	98-006-2405;96..
25.0028	3.55857	1.84	98-007-5952;96..
26.6583	3.34122	100.00	98-006-2405;98..
26.9030	3.31138	29.16	98-006-2405;98..
28.0342	3.18028	6.44	98-008-7654

30.9513	2.88687	3.28	98-007-5952;98..
31.3644	2.84978	1.82	98-007-5952;98..
33.5670	2.66765	0.76	98-007-5952;98..
34.9658	2.56407	2.27	98-007-5952;96..
36.0698	2.48808	3.75	98-007-5952;98..
36.5691	2.45525	7.58	98-006-2405;98..
37.6762	2.38560	0.72	98-007-5952;98..
39.4827	2.28051	6.25	98-006-2405;98..
40.3287	2.23460	4.15	98-006-2405;98..
42.4535	2.12755	5.23	98-006-2405;98..
45.5324	1.99058	14.92	98-007-5952;98..
45.8304	1.97833	4.64	98-006-2405;98..
50.1822	1.81649	11.44	98-006-2405;98..
54.9325	1.67011	6.30	98-006-2405;98..
55.3673	1.65802	2.43	98-006-2405;98..
60.0231	1.54006	11.31	98-006-2405;98..
62.2383	1.49046	0.48	98-007-5952;98..
62.7225	1.48011	1.29	98-007-5952;96..
64.1277	1.45103	2.27	98-006-2405;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	74
Phase Muscovite 3T (Si-rich):	Weight fraction/ %:	16
Phase Albite:	Weight fraction/ %:	7
Phase Chlorite:	Weight fraction/ %:	3

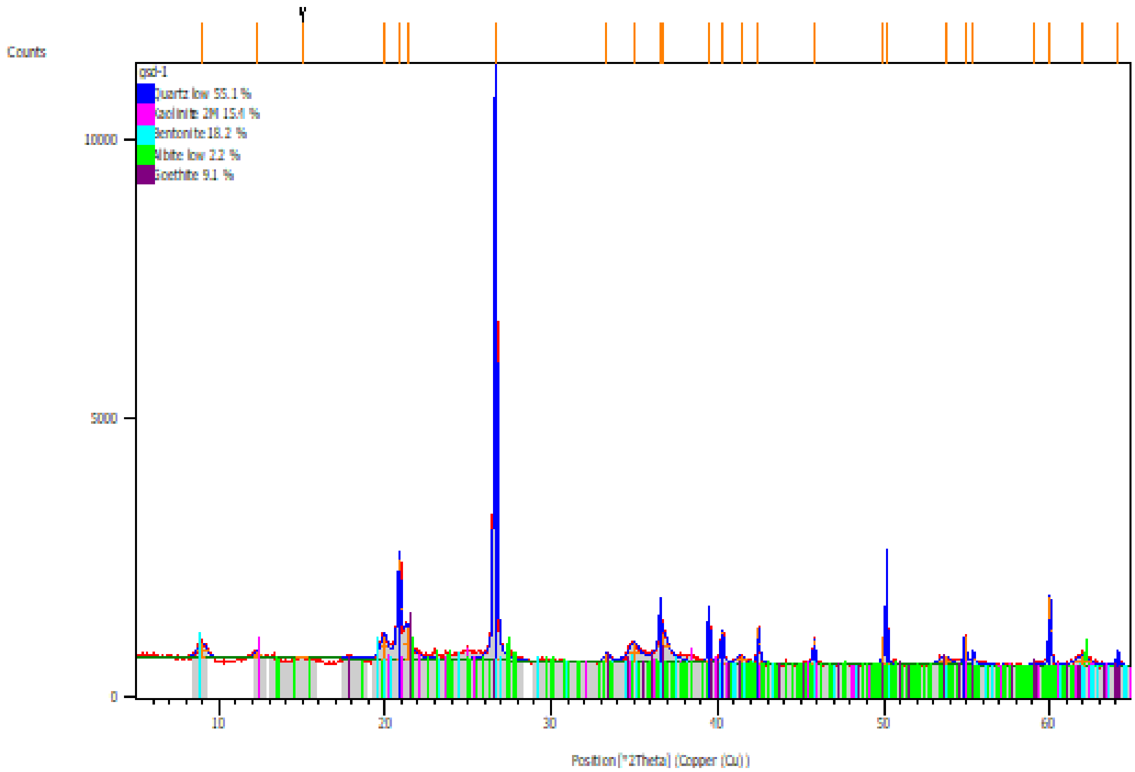
Anchor Scan Parameters

Dataset Name:	g23
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\g23.rd
Sample Identification:	GSD-AP-MW-11 (G23)
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/27/2021 9:40:00 AM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-004-1414	59	Quartz low	O2 Si1
98-003-0285	13	Kaolinite 2M	H4 Al2 O9 Si2
98-016-0437	21	Bentonite	H2 Al1.93 Ca0.06 F..
98-020-1649	9	Albite low	Al0.91 Na1 O8 Si3
98-015-9972	32	Goethite	H1 Fe1 O2

Graphics

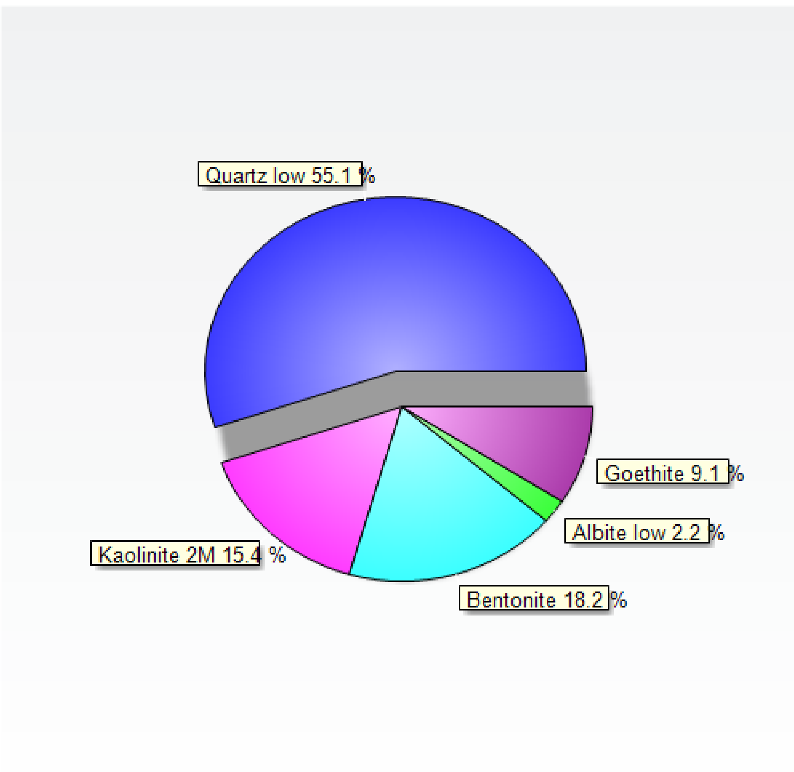


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
9.00(3)	9.81418	2.39	98-016-0437
12.29(3)	7.19860	1.29	98-003-0285
15(2)	5.88328	0.00	
19.95(1)	4.44794	3.91	98-003-0285;98..
20.856(4)	4.25581	17.07	98-004-1414;98..
21.34(1)	4.16017	5.36	98-016-0437;98..
26.6428(8)	3.34311	100.00	98-004-1414;98..
33.37(2)	2.68309	1.44	98-016-0437;98..
34.97(2)	2.56374	3.31	98-003-0285;98..
36.568(7)	2.45534	4.74	98-004-1414;98..
36.74(2)	2.44433	4.91	98-004-1414;98..
39.493(3)	2.27995	9.24	98-004-1414;98..

40.305(6)	2.23589	5.39	98-004-1414;98..
41.41(4)	2.17859	1.16	98-003-0285;98..
42.486(4)	2.12598	6.14	98-004-1414;98..
45.829(6)	1.97841	4.08	98-004-1414;98..
49.919(3)	1.82544	4.85	98-004-1414;98..
50.180(3)	1.81657	13.50	98-004-1414;98..
53.71(5)	1.70521	1.31	98-016-0437;98..
54.923(5)	1.67038	4.87	98-004-1414;98..
55.40(1)	1.65719	2.09	98-004-1414;98..
59.03(2)	1.56351	0.93	98-003-0285;98..
60.023(2)	1.54007	11.83	98-004-1414;98..
61.97(4)	1.49634	1.54	98-003-0285;98..
64.111(8)	1.45136	2.46	98-004-1414;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	55
Phase Kaolinite 2M:	Weight fraction/ %:	15
Phase Bentonite:	Weight fraction/ %:	18
Phase Albite low:	Weight fraction/ %:	2
Phase Goethite:	Weight fraction/ %:	9

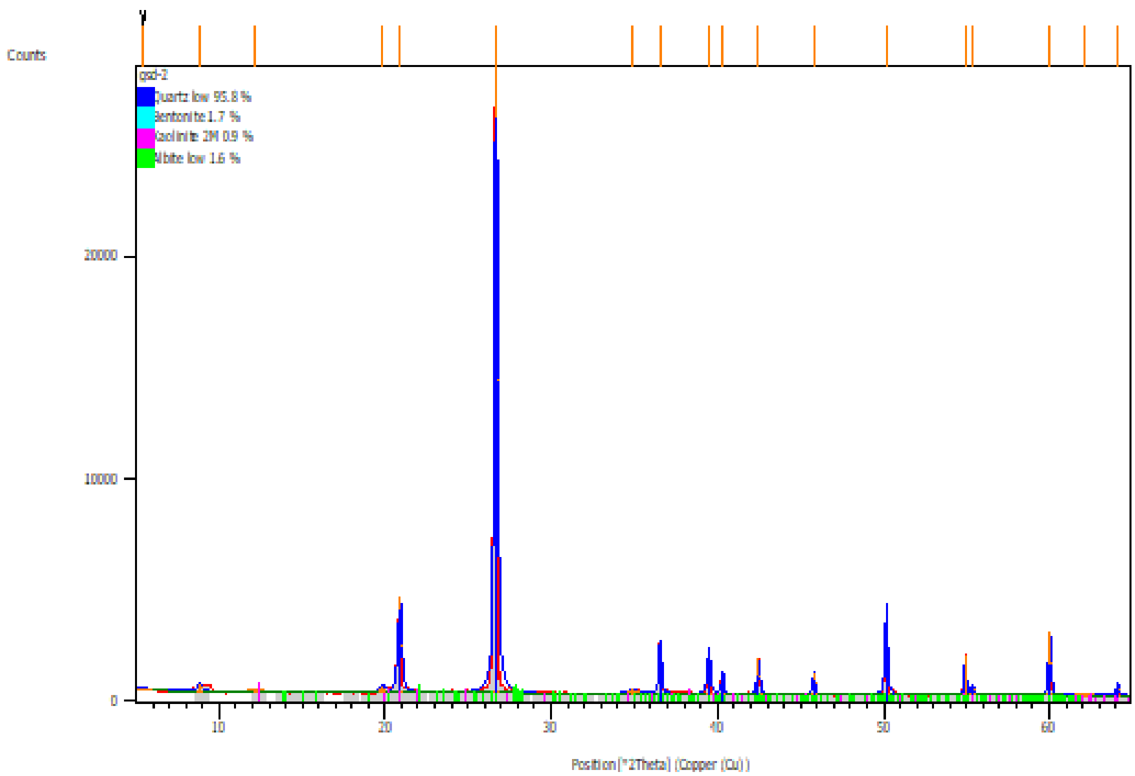
Anchor Scan Parameters

Dataset Name:	gsd-1
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-1.rd
Sample Identification:	GSD-AP-MW-2VB-11.5-1
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA_M
Measurement Date / Time:	7/26/2021 10:13:00 AM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-008-3849	80	Quartz low	O2 Si1
98-016-0437	25	Bentonite	H2 Al1.93 Ca0.06 F..
98-003-0285	12	Kaolinite 2M	H4 Al2 O9 Si2
98-020-1649	1	Albite low	Al0.91 Na1 O8 Si3

Graphics

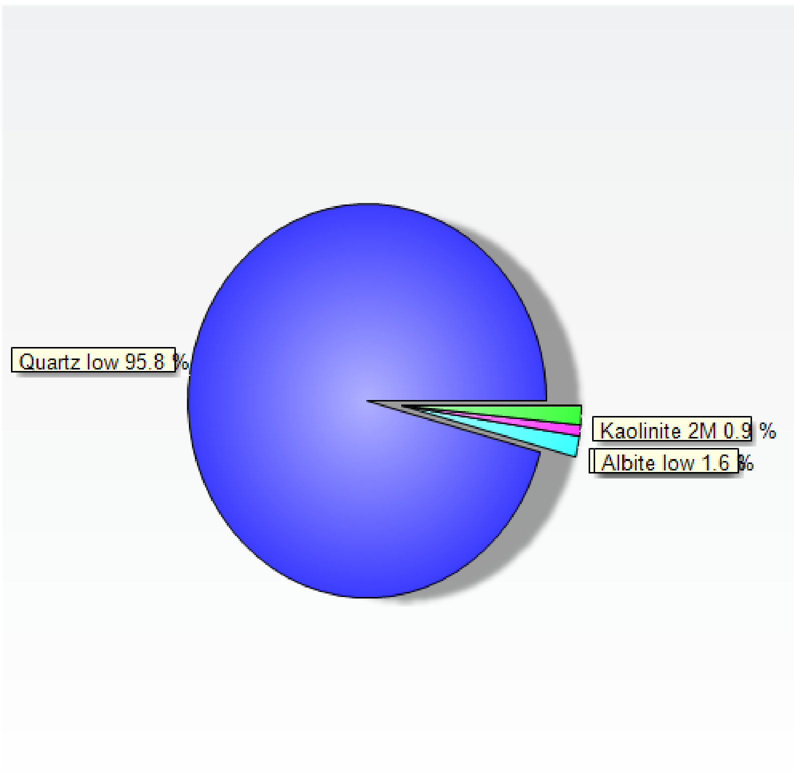


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
5.4231	16.28276	0.43	
8.8354	10.00033	1.19	98-016-0437
12.1724	7.26529	0.12	98-003-0285
19.8409	4.47118	0.90	98-016-0437;98..
20.8951	4.24793	14.65	98-008-3849;98..
26.6808	3.33844	100.00	98-008-3849;98..
34.9204	2.56729	0.66	98-016-0437;98..
36.5672	2.45537	8.09	98-008-3849;98..
39.4941	2.27988	6.41	98-008-3849;98..
40.3175	2.23519	3.66	98-008-3849;98..
42.4828	2.12615	5.59	98-008-3849;98..
45.8239	1.97860	3.42	98-008-3849;98..
50.1779	1.81664	13.78	98-008-3849;98..

54.9257	1.67030	6.18	98-008-3849;98..
55.3524	1.65843	1.67	98-008-3849;98..
60.0158	1.54023	9.70	98-008-3849;98..
62.0415	1.49471	0.26	98-016-0437;98..
64.0962	1.45167	1.83	98-008-3849;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	96
Phase Bentonite:	Weight fraction/ %:	1.7
Phase Kaolinite 2M:	Weight fraction/ %:	1
Phase Albite low:	Weight fraction/ %:	1.6

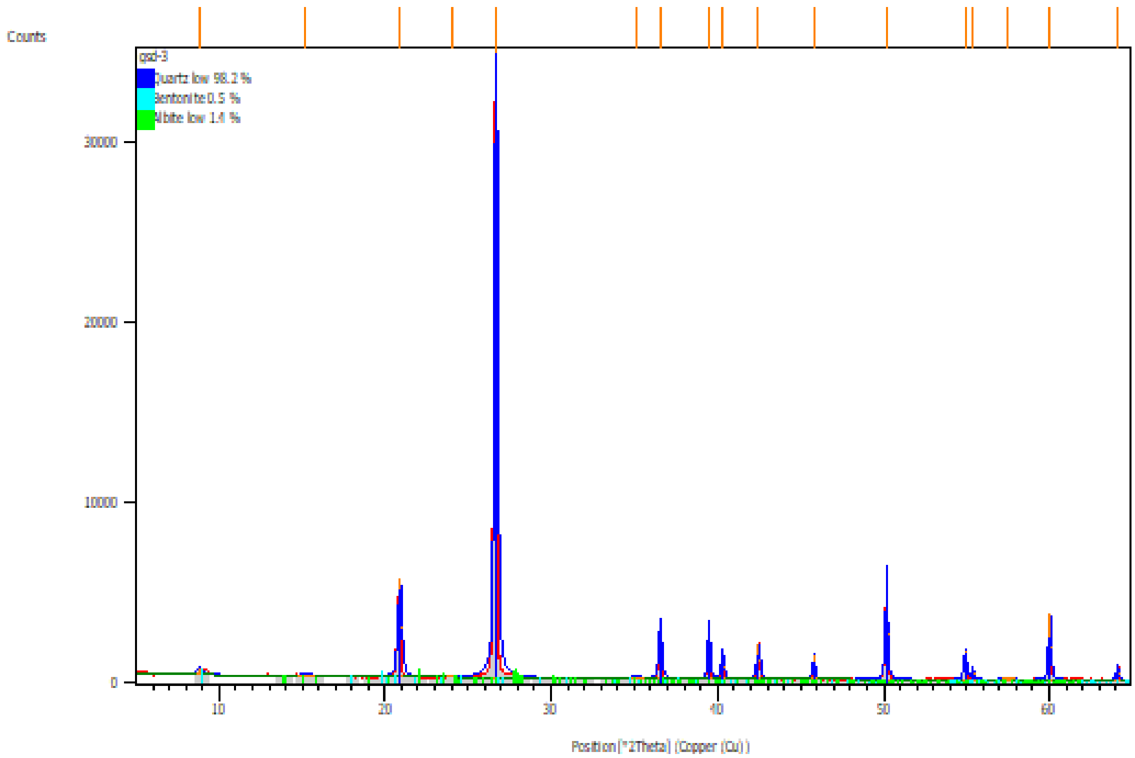
Anchor Scan Parameters

Dataset Name:	gsd-2
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-2.rd
Sample Identification:	GSD-AP-MW-2VB-13.0-1
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA_M
Measurement Date / Time:	7/26/2021 12:12:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-006-2405	84	Quartz low	O2 Si1
98-016-0437	8	Bentonite	H2 Al1.93 Ca0.06 F..
98-020-1649	5	Albite low	Al0.91 Na1 O8 Si3

Graphics

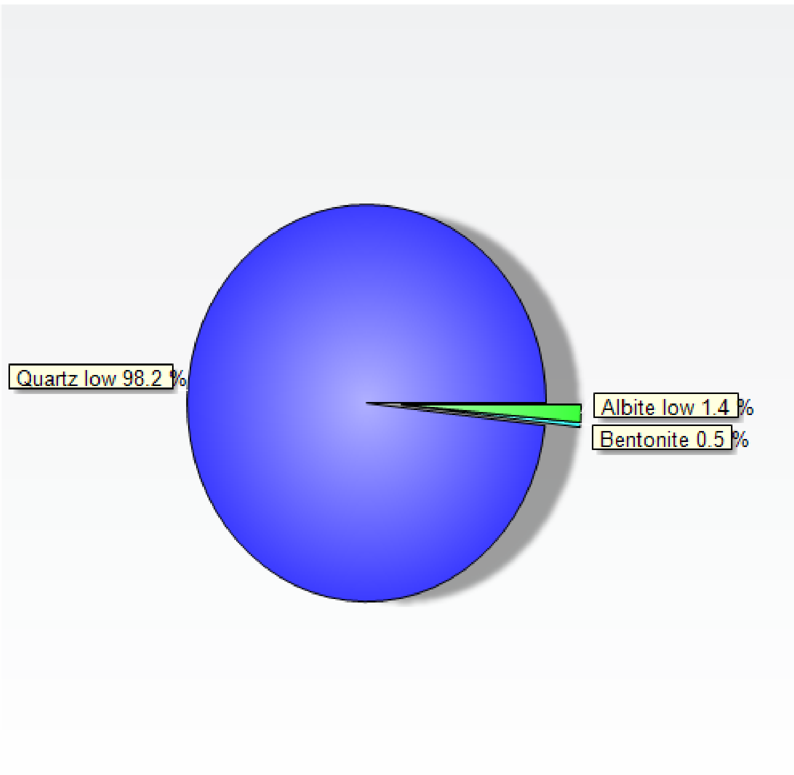


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
8.8556	9.97764	0.97	98-016-0437
15.2629	5.80043	0.22	98-020-1649
20.8965	4.24765	15.26	98-006-2405;98..
24.0122	3.70308	0.17	98-020-1649
26.6860	3.33780	100.00	98-006-2405;98..
35.1186	2.55326	0.28	98-016-0437;98..
36.5714	2.45509	7.83	98-006-2405;98..
39.5021	2.27944	7.48	98-006-2405;98..
40.3348	2.23428	3.74	98-006-2405;98..
42.4866	2.12597	5.59	98-006-2405;98..
45.8225	1.97865	3.94	98-006-2405;98..
50.1901	1.81622	14.15	98-006-2405;98..
54.9342	1.67007	4.70	98-006-2405;98..
55.3699	1.65795	1.75	98-006-2405;98..

57.4845	1.60189	0.21	98-006-2405;98..
60.0192	1.54015	10.13	98-006-2405;98..
64.1027	1.45154	2.13	98-006-2405;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	98
Phase Bentonite:	Weight fraction/ %:	0.5
Phase Albite low:	Weight fraction/ %:	1.5

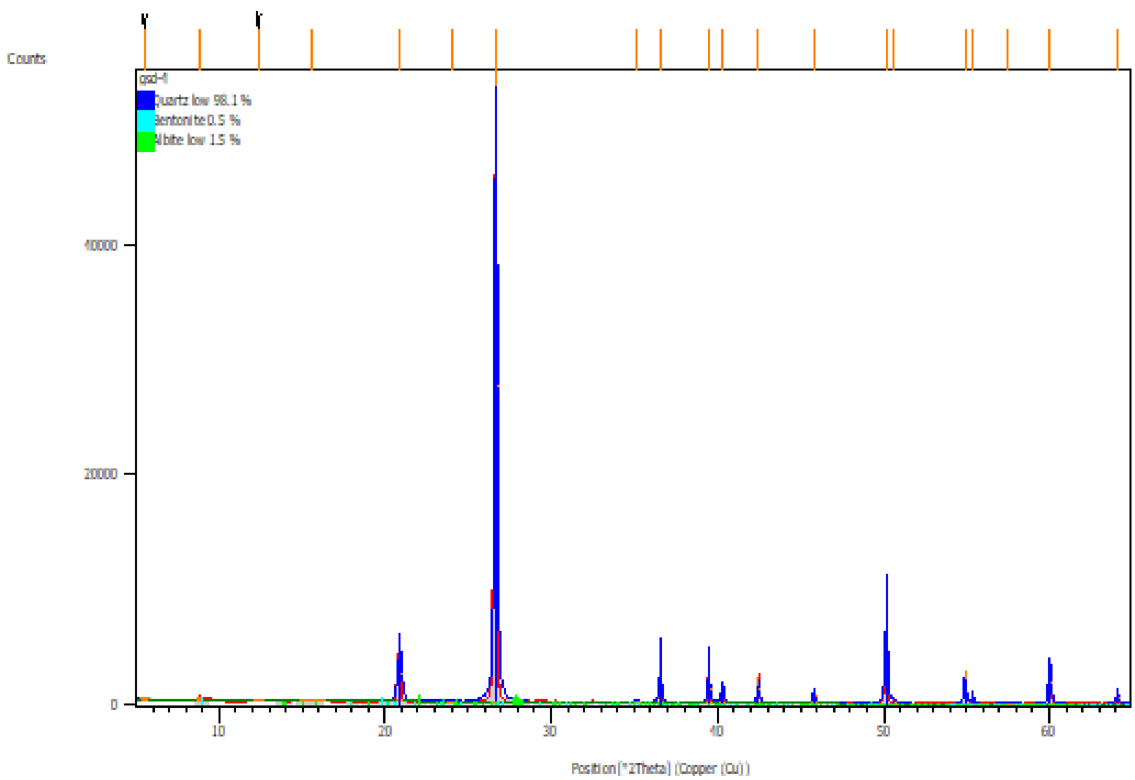
Anchor Scan Parameters

Dataset Name:	gsd-3
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-3.rd
Sample Identification:	GSD-AP-MW-2VB-14.5-1
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA_M
Measurement Date / Time:	7/26/2021 2:09:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-002-7826	78	Quartz low	O2 Si1
98-016-0437	12	Bentonite	H2 Al1.93 Ca0.06 F..
98-020-1649	8	Albite low	Al0.91 Na1 O8 Si3

Graphics

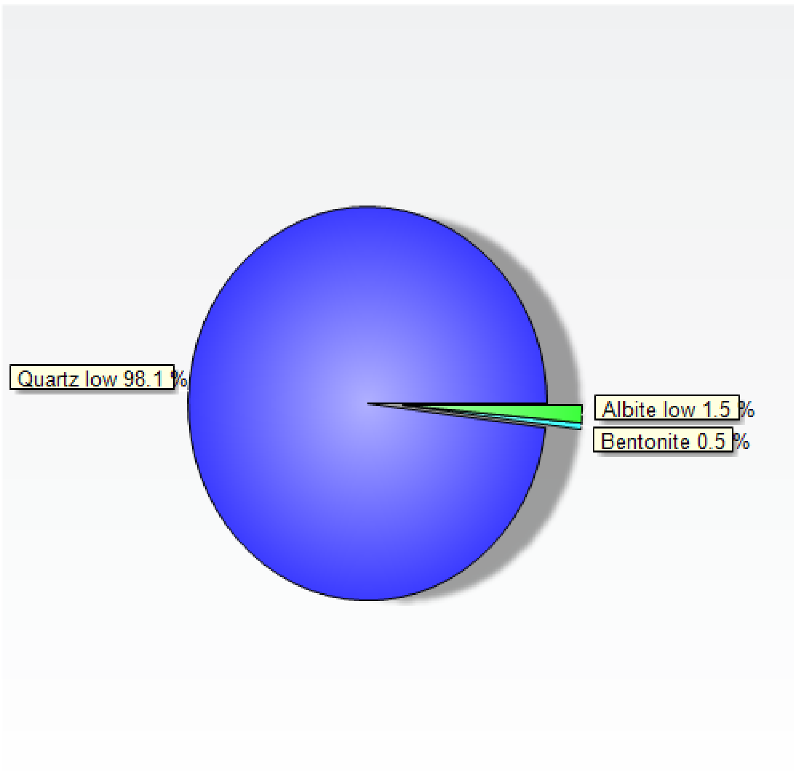


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
5.4991	16.05797	0.23	
8.8128	10.02591	0.63	98-016-0437
12.3647	7.15270	0.17	
15.6431	5.66029	0.09	98-020-1649
20.8869	4.24958	8.86	98-002-7826;98..
23.9981	3.70522	0.12	98-020-1649
26.6730	3.33940	100.00	98-002-7826;98..
35.1487	2.55114	0.22	98-016-0437;98..
36.5766	2.45476	4.36	98-002-7826;98..
39.4815	2.28058	4.35	98-002-7826;98..
40.3229	2.23491	3.10	98-002-7826;98..
42.4780	2.12638	3.97	98-002-7826;98..
45.8207	1.97872	2.11	98-002-7826;98..
50.1827	1.81647	14.47	98-002-7826;98..

50.5894	1.80282	0.40	98-002-7826;98..
54.9246	1.67033	5.22	98-002-7826;98..
55.3598	1.65823	1.51	98-002-7826;98..
57.4496	1.60277	0.13	98-002-7826;98..
60.0221	1.54008	6.51	98-002-7826;98..
64.1045	1.45150	1.34	98-002-7826;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	98
Phase Bentonite:	Weight fraction/ %:	0.5
Phase Albite low:	Weight fraction/ %:	1.5

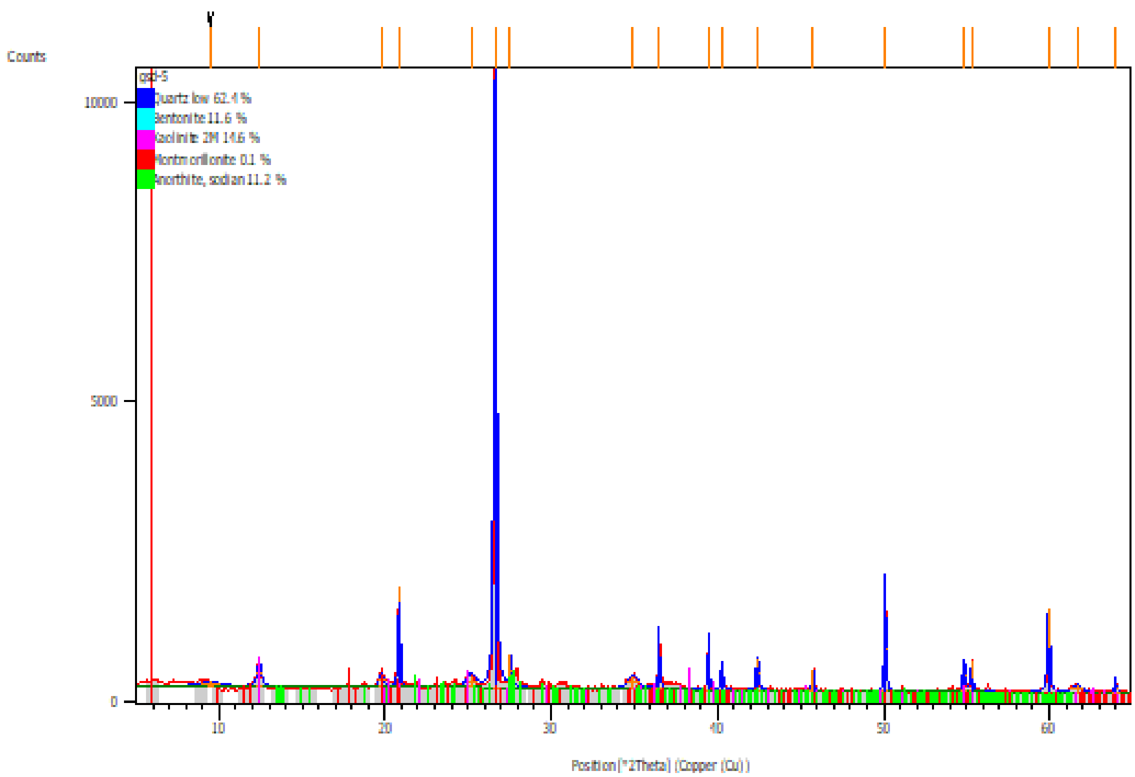
Anchor Scan Parameters

Dataset Name:	gsd-4
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-4.rd
Sample Identification:	GSD-AP-MW-2VB-16.0-1
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA_M
Measurement Date / Time:	7/26/2021 4:04:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	1.0000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-020-0721	66	Quartz low	O2 Si1
98-016-0437	19	Bentonite	H2 Al1.93 Ca0.06 F..
98-003-0285	22	Kaolinite 2M	H4 Al2 O9 Si2
98-016-1171	5	Montmorillonite	H1 Al2 Ca0.5 O12 Si4
98-006-1330	10	Anorthite, sodian	Al1.55 Ca0.55 Na0...

Graphics

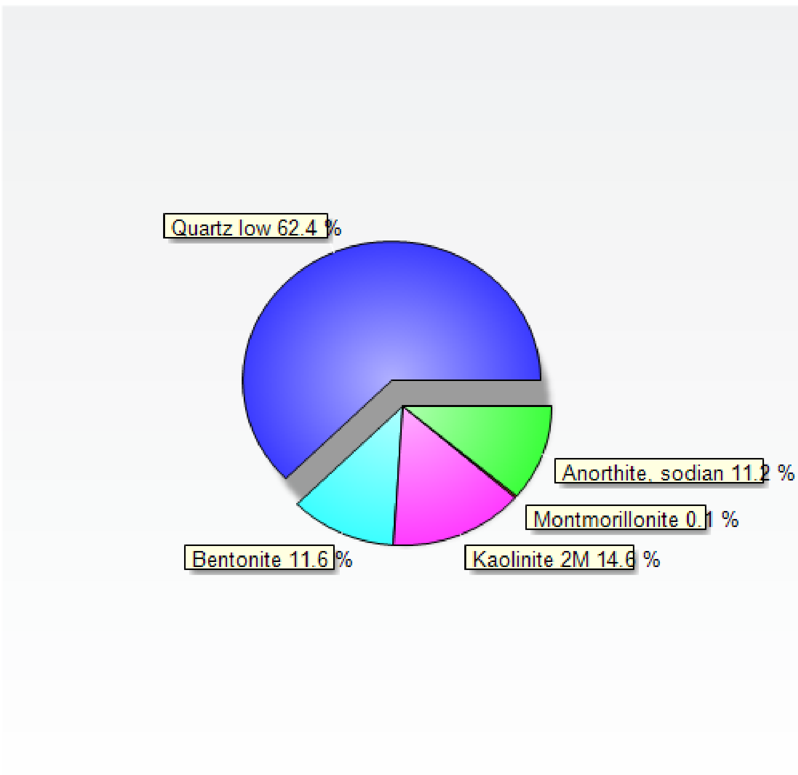


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
9.4813	9.32048	0.73	
12.4232	7.11916	3.76	98-003-0285
19.7803	4.48476	2.35	98-016-0437;98..
20.8467	4.25768	15.91	98-020-0721;98..
25.1882	3.53278	2.05	98-003-0285;98..
26.6317	3.34449	100.00	98-020-0721;98..
27.5609	3.23381	5.34	98-003-0285;98..
34.9340	2.56633	2.10	98-016-0437;98..
36.5005	2.45970	6.53	98-020-0721;98..
39.4490	2.28238	6.00	98-020-0721;98..
40.2755	2.23743	4.28	98-020-0721;98..
42.4198	2.12916	5.21	98-020-0721;98..

45.7688	1.98085	3.46	98-020-0721;98..
50.1171	1.81870	13.20	98-020-0721;98..
54.8561	1.67226	4.92	98-020-0721;98..
55.3156	1.65945	4.81	98-020-0721;98..
59.9395	1.54201	13.31	98-020-0721;98..
61.6758	1.50270	1.13	98-016-0437;98..
64.0008	1.45360	1.18	98-020-0721;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	62
Phase Bentonite:	Weight fraction/ %:	12
Phase Kaolinite 2M:	Weight fraction/ %:	15
Phase Montmorillonite:	Weight fraction/ %:	0.1
Phase Anorthite, sodian:	Weight fraction/ %:	11

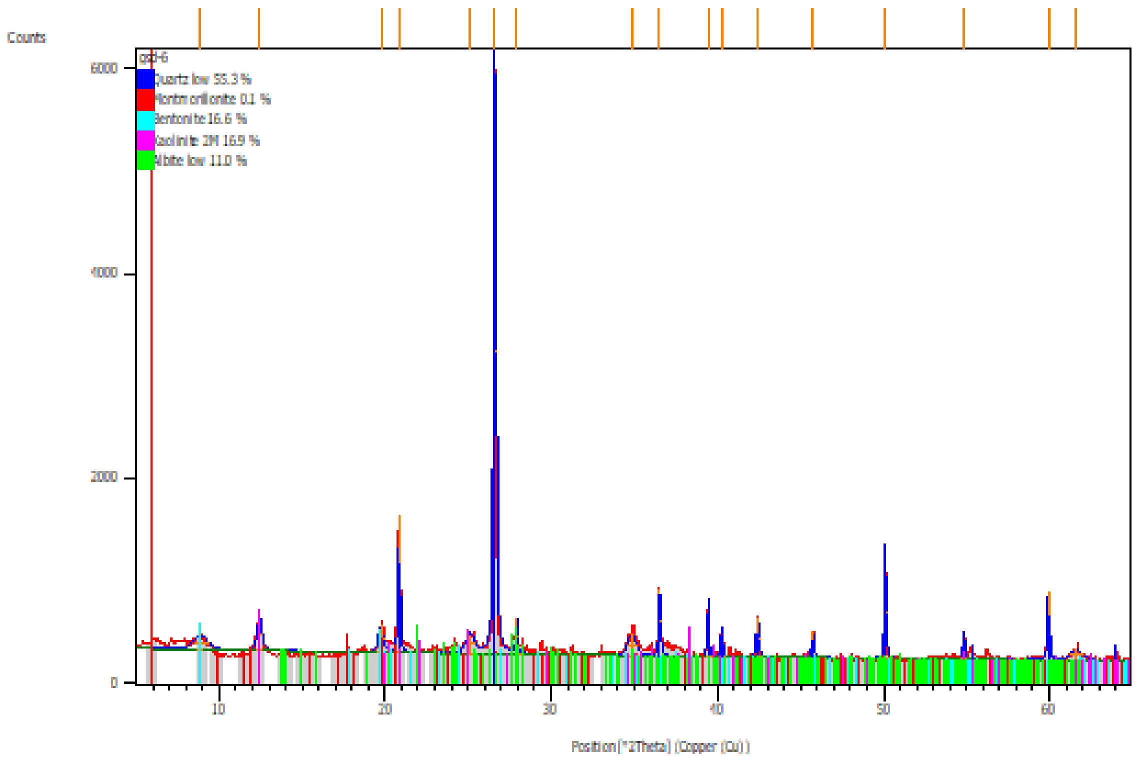
Anchor Scan Parameters

Dataset Name:	gsd-5
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-5.rd
Sample Identification:	GSD-AP-MW-2VB-17.5-1
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/29/2021 9:47:00 AM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	0.5000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-010-0341	54	Quartz low	O2 Si1
98-016-1171	4	Montmorillonite	H1 Al2 Ca0.5 O12 Si4
98-016-0437	22	Bentonite	H2 Al1.93 Ca0.06 F..
98-003-0285	19	Kaolinite 2M	H4 Al2 O9 Si2
98-020-1649	18	Albite low	Al0.91 Na1 O8 Si3

Graphics

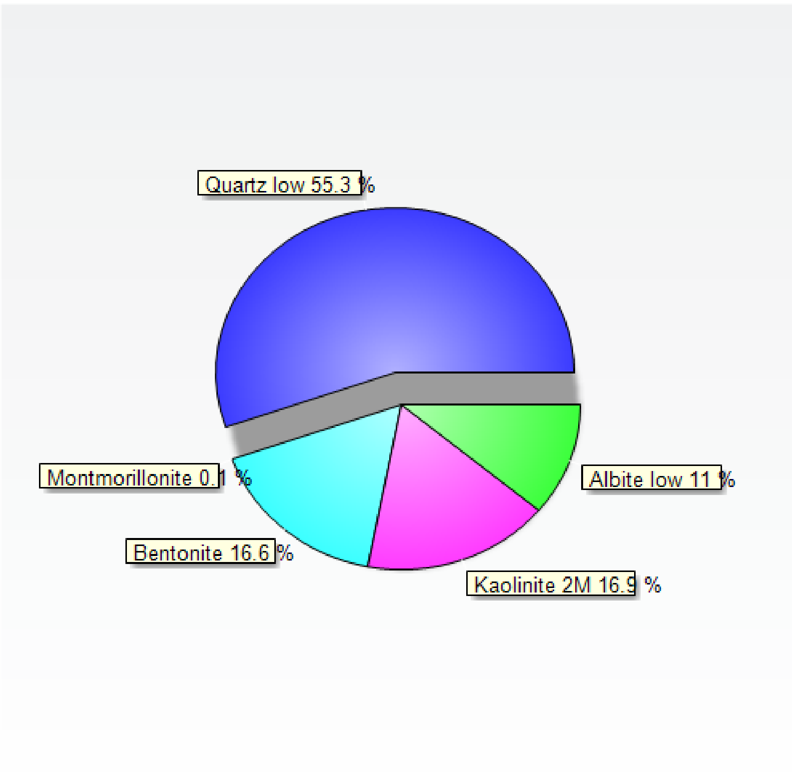


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
8.8927	9.93602	2.38	98-016-0437
12.4516	7.10297	5.45	98-003-0285
19.7465	4.49235	4.44	98-016-1171;98..
20.8420	4.25863	22.84	98-010-0341;98..
25.1260	3.54139	3.21	98-003-0285;98..
26.6190	3.34606	100.00	98-010-0341;98..
27.9249	3.19248	6.21	98-020-1649
34.8404	2.57301	3.63	98-016-1171;98..
36.5248	2.45812	11.06	98-010-0341;98..
39.4337	2.28323	7.84	98-010-0341;98..
40.2690	2.23778	4.39	98-010-0341;98..
42.4270	2.12882	6.56	98-010-0341;98..

45.7656	1.98098	4.41	98-010-0341;98..
50.1207	1.81858	15.16	98-010-0341;98..
54.8433	1.67262	4.24	98-010-0341;98..
59.9352	1.54211	11.43	98-010-0341;98..
61.6258	1.50380	1.74	98-016-1171;98..

Quantitative Results



Phase Quartz low:	Weight fraction/ %:	55
Phase Montmorillonite:	Weight fraction/ %:	0.1
Phase Bentonite:	Weight fraction/ %:	17
Phase Kaolinite 2M:	Weight fraction/ %:	17
Phase Albite low:	Weight fraction/ %:	11

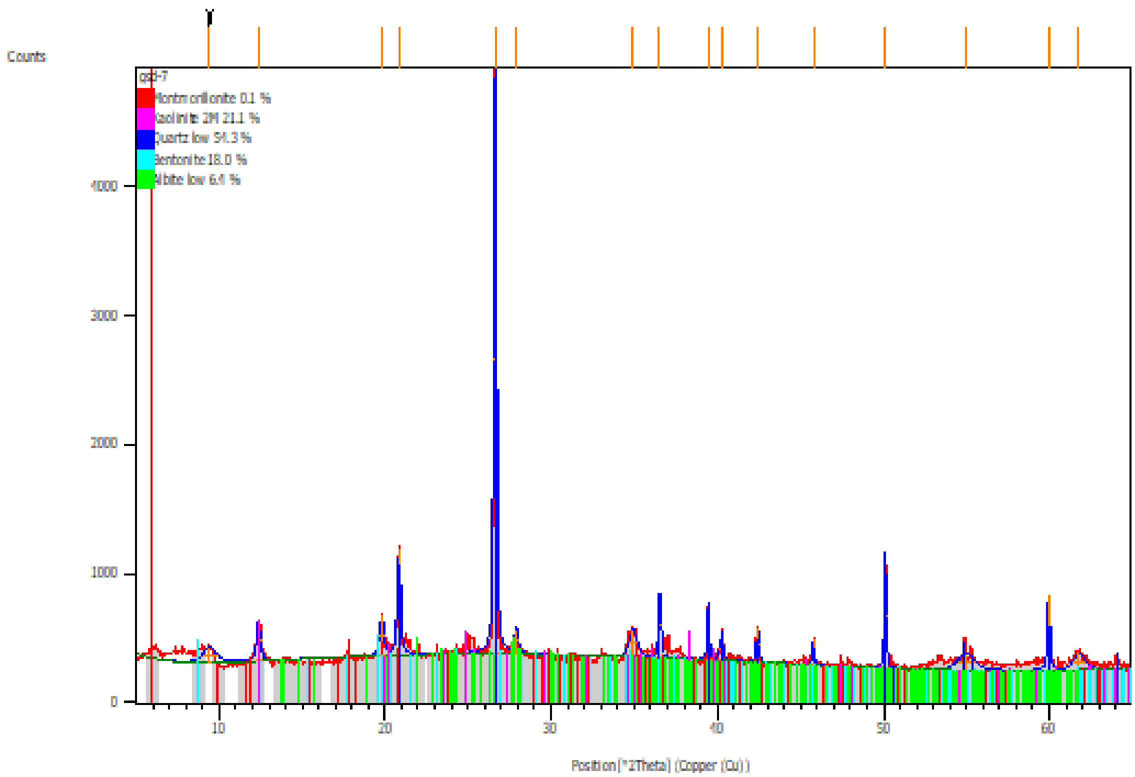
Anchor Scan Parameters

Dataset Name:	gsd-6
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-6.rd
Sample Identification:	GSD-AP-MW-2VB-19.0-2
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/29/2021 11:41:00 AM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	0.5000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Pattern List

Ref.Code	Score	Compound Name	Chem. Formula
98-016-1171	4	Montmorillonite	H1 Al2 Ca0.5 O12 Si4
98-003-0285	11	Kaolinite 2M	H4 Al2 O9 Si2
98-010-0341	71	Quartz low	O2 Si1
98-016-0437	8	Bentonite	H2 Al1.93 Ca0.06 F..
98-020-1649	6	Albite low	Al0.91 Na1 O8 Si3

Graphics

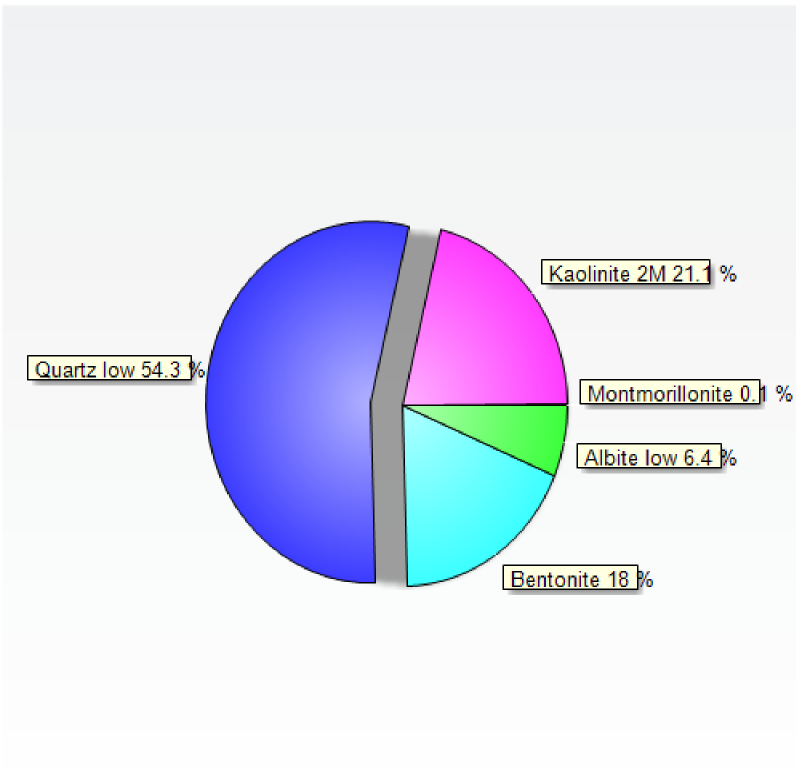


Peak List

Pos.[°2Th.]	d-spacing [Å]	Rel. Int. [%]	Matched by
9.4468	9.35444	2.53	
12.3836	7.14183	6.79	98-003-0285
19.8030	4.47965	6.79	98-016-1171;98..
20.8398	4.25908	17.75	98-016-1171;98..
26.6327	3.34436	100.00	98-016-1171;98..
27.8997	3.19530	4.10	98-020-1649
34.9392	2.56595	4.58	98-016-1171;98..
36.5415	2.45703	10.59	98-016-1171;98..
39.4510	2.28227	9.04	98-016-1171;98..
40.2548	2.23853	3.57	98-016-1171;98..
42.4290	2.12872	5.81	98-016-1171;98..
45.7876	1.98008	4.47	98-016-1171;98..

50.1242	1.81846	17.29	98-016-1171;98..
54.9987	1.66826	2.88	98-016-1171;98..
59.9478	1.54181	12.46	98-016-1171;98..
61.7833	1.50034	2.85	98-016-1171;98..

Quantitative Results



Phase Montmorillonite:	Weight fraction/ %:	0.1
Phase Kaolinite 2M:	Weight fraction/ %:	21
Phase Quartz low:	Weight fraction/ %:	54
Phase Bentonite:	Weight fraction/ %:	18
Phase Albite low:	Weight fraction/ %:	6

Anchor Scan Parameters

Dataset Name:	gsd-7
File name:	C:\Documents and Settings\hugo\My Documents\PANalytical\AnchrQEA\AnchorQEA-2021July26\gsd-7.rd
Sample Identification:	GSD-AP-MW-2VB-20.5-2
Comment:	Exported by X'Pert SW Generated by hugo in project AnchorQEA-2
Measurement Date / Time:	7/29/2021 1:38:00 PM
Raw Data Origin:	PHILIPS-binary (scan) (.RD)
Scan Axis:	Gonio
Start Position [°2Th.]:	5.0200
End Position [°2Th.]:	64.9400
Step Size [°2Th.]:	0.0400
Scan Step Time [s]:	4.5000
Scan Type:	Continuous
Offset [°2Th.]:	0.0000
Divergence Slit Type:	Fixed
Divergence Slit Size [°]:	0.5000
Specimen Length [mm]:	10.00
Receiving Slit Size [mm]:	0.1000
Measurement Temperature [°C]:	0.00
Anode Material:	Cu
K-Alpha1 [Å]:	1.54060
Generator Settings:	30 mA, 40 kV
Diffractometer Type:	XPert MPD
Diffractometer Number:	1
Goniometer Radius [mm]:	200.00
Dist. Focus-Diverg. Slit [mm]:	91.00
Incident Beam Monochromator:	No
Spinning:	No

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Tuesday, July 27, 2021

Anthony Dalton-Atha
Anchor QEA, LLC
6720 SW Macadam Ave. Suite 125
Portland, OR 97219

RE: A1G0665 - Alabama Power-Gadsden - 201114-03.02

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A1G0665, which was received by the laboratory on 7/23/2021 at 12:05:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: dthomas@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of sample receipt, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler#1 2.2 degC

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Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: OR100062

ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GSD-AP-CEC-1-20210722	A1G0665-01	Water	07/22/21 10:00	07/23/21 12:05
GSD-AP-CEC-2-20210722	A1G0665-02	Water	07/22/21 10:05	07/23/21 12:05
GSD-AP-CEC-3-20210722	A1G0665-03	Water	07/22/21 10:10	07/23/21 12:05
GSD-AP-CEC-4-20210722	A1G0665-04	Water	07/22/21 10:15	07/23/21 12:05
GSD-AP-CEC-5-20210722	A1G0665-05	Water	07/22/21 10:20	07/23/21 12:05
GSD-AP-CEC-6-20210722	A1G0665-06	Water	07/22/21 10:25	07/23/21 12:05
GSD-AP-CEC-7-20210722	A1G0665-07	Water	07/22/21 10:30	07/23/21 12:05
GSD-AP-CEC-8-20210722	A1G0665-08	Water	07/22/21 10:35	07/23/21 12:05
GSD-AP-CEC-9-20210722	A1G0665-09	Water	07/22/21 10:40	07/23/21 12:05
GSD-AP-CEC-10-20210722	A1G0665-10	Water	07/22/21 10:45	07/23/21 12:05
GSD-AP-CEC-11-20210722	A1G0665-11	Water	07/22/21 10:50	07/23/21 12:05
GSD-AP-CEC-12-20210722	A1G0665-12	Water	07/22/21 10:55	07/23/21 12:05
GSD-AP-CEC-13-20210722	A1G0665-13	Water	07/22/21 11:00	07/23/21 12:05
GSD-AP-CEC-14-20210722	A1G0665-14	Water	07/22/21 11:05	07/23/21 12:05
GSD-AP-CEC-MB-20210722	A1G0665-15	Water	07/22/21 11:10	07/23/21 12:05

DRAFT REPORT

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APEX LABORATORIES

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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503-718-2323
ORELAP ID: OR100062

ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: 201114-03.02	**Report ID:**
Portland, OR 97219	Project Manager: Anthony Dalton-Atha	A1G0665 - 07 27 21 2116

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-CEC-1-20210722 (A1G0665-01)				**Matrix: Water**				
Batch: 1070784								
Aluminum	ND	225	450	ug/L	5	07/26/21 21:06	EPA 6020B	R-03, R-04
Arsenic	**803**	4.50	9.00	ug/L	5	07/26/21 21:06	EPA 6020B	
Magnesium	**32400**	675	1350	ug/L	5	07/26/21 21:06	EPA 6020B	**B**
Potassium	**25000**	450	900	ug/L	5	07/26/21 21:06	EPA 6020B	**B**
Sodium	**16900**	450	900	ug/L	5	07/26/21 21:06	EPA 6020B	**B**
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 21:06	EPA 6020B	R-03, R-04
GSD-AP-CEC-1-20210722 (A1G0665-01RE1)				**Matrix: Water**				
Batch: 1070784								
Calcium	**1390000**	27000	54000	ug/L	50	07/27/21 16:03	EPA 6020B	**B**
GSD-AP-CEC-2-20210722 (A1G0665-02)				**Matrix: Water**				
Batch: 1070784								
Aluminum	ND	225	450	ug/L	5	07/26/21 21:11	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 21:11	EPA 6020B	R-03, R-04
Magnesium	**18100**	675	1350	ug/L	5	07/26/21 21:11	EPA 6020B	**B**
Potassium	**9750**	450	900	ug/L	5	07/26/21 21:11	EPA 6020B	**B**
Sodium	**3140**	450	900	ug/L	5	07/26/21 21:11	EPA 6020B	**B**
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 21:11	EPA 6020B	R-03, R-04
GSD-AP-CEC-2-20210722 (A1G0665-02RE1)				**Matrix: Water**				
Batch: 1070784								
Calcium	**1260000**	27000	54000	ug/L	50	07/27/21 16:08	EPA 6020B	**B**
GSD-AP-CEC-3-20210722 (A1G0665-03)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 21:53	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 21:53	EPA 6020B	R-03, R-04
Magnesium	**39000**	675	1350	ug/L	5	07/26/21 21:53	EPA 6020B	
Potassium	**11200**	450	900	ug/L	5	07/26/21 21:53	EPA 6020B	
Sodium	**9590**	450	900	ug/L	5	07/26/21 21:53	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 21:53	EPA 6020B	R-03, R-04
GSD-AP-CEC-3-20210722 (A1G0665-03RE1)				**Matrix: Water**				

DRAFT REPORT

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Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: OR100062

ANALYTICAL REPORT

Anchor QEA, LLC 6720 SW Macadam Ave. Suite 125 Portland, OR 97219	Project: Alabama Power-Gadsden Project Number: 201114-03.02 Project Manager: Anthony Dalton-Atha	Report ID: A1G0665 - 07 27 21 2116

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-CEC-3-20210722 (A1G0665-03RE1)				Matrix: Water				
Batch: 1070786								
Calcium	**1230000**	27000	54000	ug/L	50	07/27/21 16:13	EPA 6020B	
GSD-AP-CEC-4-20210722 (A1G0665-04)				Matrix: Water				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 21:58	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 21:58	EPA 6020B	R-03, R-04
Calcium	**228000**	2700	5400	ug/L	5	07/26/21 21:58	EPA 6020B	
Magnesium	**8650**	675	1350	ug/L	5	07/26/21 21:58	EPA 6020B	
Potassium	**3620**	450	900	ug/L	5	07/26/21 21:58	EPA 6020B	
Sodium	**14500**	450	900	ug/L	5	07/26/21 21:58	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 21:58	EPA 6020B	R-03, R-04
GSD-AP-CEC-5-20210722 (A1G0665-05)				Matrix: Water				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 22:03	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 22:03	EPA 6020B	R-03, R-04
Magnesium	**14800**	675	1350	ug/L	5	07/26/21 22:03	EPA 6020B	
Potassium	**4370**	450	900	ug/L	5	07/26/21 22:03	EPA 6020B	
Sodium	**6540**	450	900	ug/L	5	07/26/21 22:03	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 22:03	EPA 6020B	R-03, R-04
GSD-AP-CEC-5-20210722 (A1G0665-05RE1)				Matrix: Water				
Batch: 1070786								
Calcium	**1210000**	27000	54000	ug/L	50	07/27/21 16:18	EPA 6020B	
GSD-AP-CEC-6-20210722 (A1G0665-06)				Matrix: Water				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 22:08	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 22:08	EPA 6020B	R-03, R-04
Calcium	**189000**	2700	5400	ug/L	5	07/26/21 22:08	EPA 6020B	
Magnesium	**20300**	675	1350	ug/L	5	07/26/21 22:08	EPA 6020B	
Potassium	**5520**	450	900	ug/L	5	07/26/21 22:08	EPA 6020B	
Sodium	**13900**	450	900	ug/L	5	07/26/21 22:08	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 22:08	EPA 6020B	R-03, R-04

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APEX LABORATORIES

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-CEC-7-20210722 (A1G0665-07)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 22:14	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 22:14	EPA 6020B	R-03, R-04
Calcium	**90400**	2700	5400	ug/L	5	07/26/21 22:14	EPA 6020B	
Magnesium	**20400**	675	1350	ug/L	5	07/26/21 22:14	EPA 6020B	
Potassium	**19000**	450	900	ug/L	5	07/26/21 22:14	EPA 6020B	
Sodium	**3150**	450	900	ug/L	5	07/26/21 22:14	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 22:14	EPA 6020B	R-03, R-04
GSD-AP-CEC-8-20210722 (A1G0665-08)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 22:35	EPA 6020B	R-03, R-04
Arsenic	**8.74**	4.50	9.00	ug/L	5	07/26/21 22:35	EPA 6020B	**J, Q-42, R-03, R-04**
Calcium	**62900**	2700	5400	ug/L	5	07/26/21 22:35	EPA 6020B	**Q-42**
Magnesium	**17000**	675	1350	ug/L	5	07/26/21 22:35	EPA 6020B	
Potassium	**16300**	450	900	ug/L	5	07/26/21 22:35	EPA 6020B	
Sodium	**2400**	450	900	ug/L	5	07/26/21 22:35	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 22:35	EPA 6020B	R-03, R-04
GSD-AP-CEC-9-20210722 (A1G0665-09)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 22:45	EPA 6020B	R-03, R-04
Arsenic	**6.29**	4.50	9.00	ug/L	5	07/26/21 22:45	EPA 6020B	**J, R-03, R-04**
Calcium	**55000**	2700	5400	ug/L	5	07/26/21 22:45	EPA 6020B	
Magnesium	**11300**	675	1350	ug/L	5	07/26/21 22:45	EPA 6020B	
Potassium	**10200**	450	900	ug/L	5	07/26/21 22:45	EPA 6020B	
Sodium	**2120**	450	900	ug/L	5	07/26/21 22:45	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 22:45	EPA 6020B	R-03, R-04
GSD-AP-CEC-10-20210722 (A1G0665-10)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 22:56	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 22:56	EPA 6020B	R-03, R-04

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ORELAP ID: **OR100062**

ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-CEC-10-20210722 (A1G0665-10)				**Matrix: Water**				
Calcium	**370000**	2700	5400	ug/L	5	07/26/21 22:56	EPA 6020B	
Magnesium	**14300**	675	1350	ug/L	5	07/26/21 22:56	EPA 6020B	
Potassium	**14700**	450	900	ug/L	5	07/26/21 22:56	EPA 6020B	
Sodium	**2530**	450	900	ug/L	5	07/26/21 22:56	EPA 6020B	
Lithium	**23.2**	22.5	45.0	ug/L	5	07/26/21 22:56	EPA 6020B	**J, R-03, R-04**
GSD-AP-CEC-11-20210722 (A1G0665-11)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 23:01	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 23:01	EPA 6020B	R-03, R-04
Magnesium	**57600**	675	1350	ug/L	5	07/26/21 23:01	EPA 6020B	
Potassium	**38200**	450	900	ug/L	5	07/26/21 23:01	EPA 6020B	
Sodium	**7870**	450	900	ug/L	5	07/26/21 23:01	EPA 6020B	
Lithium	**53.5**	22.5	45.0	ug/L	5	07/26/21 23:01	EPA 6020B	**R-03, R-04**
GSD-AP-CEC-11-20210722 (A1G0665-11RE1)				**Matrix: Water**				
Batch: 1070786								
Calcium	**1420000**	27000	54000	ug/L	50	07/27/21 16:24	EPA 6020B	
GSD-AP-CEC-12-20210722 (A1G0665-12)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 23:06	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 23:06	EPA 6020B	R-03, R-04
Magnesium	**76300**	675	1350	ug/L	5	07/26/21 23:06	EPA 6020B	
Potassium	**38500**	450	900	ug/L	5	07/26/21 23:06	EPA 6020B	
Sodium	**9080**	450	900	ug/L	5	07/26/21 23:06	EPA 6020B	
Lithium	**64.6**	22.5	45.0	ug/L	5	07/26/21 23:06	EPA 6020B	**R-03, R-04**
GSD-AP-CEC-12-20210722 (A1G0665-12RE1)				**Matrix: Water**				
Batch: 1070786								
Calcium	**1530000**	27000	54000	ug/L	50	07/27/21 16:29	EPA 6020B	
GSD-AP-CEC-13-20210722 (A1G0665-13)				**Matrix: Water**				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 23:11	EPA 6020B	R-03, R-04

DRAFT REPORT

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APEX LABORATORIES

ANALYTICAL REPORT

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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503-718-2323
ORELAP ID: OR100062

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	A1G0665 - 07 27 21 2116

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-CEC-13-20210722 (A1G0665-13)				Matrix: Water				
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 23:11	EPA 6020B	R-03, R-04
Calcium	**431000**	2700	5400	ug/L	5	07/26/21 23:11	EPA 6020B	
Magnesium	**74200**	675	1350	ug/L	5	07/26/21 23:11	EPA 6020B	
Potassium	**40100**	450	900	ug/L	5	07/26/21 23:11	EPA 6020B	
Sodium	**8470**	450	900	ug/L	5	07/26/21 23:11	EPA 6020B	
Lithium	**78.5**	22.5	45.0	ug/L	5	07/26/21 23:11	EPA 6020B	**R-03, R-04**
GSD-AP-CEC-14-20210722 (A1G0665-14)				Matrix: Water				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 23:16	EPA 6020B	R-03, R-04
Arsenic	**7.04**	4.50	9.00	ug/L	5	07/26/21 23:16	EPA 6020B	**J, R-03, R-04**
Calcium	**56100**	2700	5400	ug/L	5	07/26/21 23:16	EPA 6020B	
Magnesium	**14700**	675	1350	ug/L	5	07/26/21 23:16	EPA 6020B	
Potassium	**13800**	450	900	ug/L	5	07/26/21 23:16	EPA 6020B	
Sodium	**2120**	450	900	ug/L	5	07/26/21 23:16	EPA 6020B	
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 23:16	EPA 6020B	R-03, R-04
GSD-AP-CEC-MB-20210722 (A1G0665-15)				Matrix: Water				
Batch: 1070786								
Aluminum	ND	225	450	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04
Calcium	ND	2700	5400	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04
Magnesium	ND	675	1350	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04
Potassium	ND	450	900	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04
Sodium	ND	450	900	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04
Lithium	ND	22.5	45.0	ug/L	5	07/26/21 23:32	EPA 6020B	R-03, R-04

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ORELAP ID: **OR100062**

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1070784 - EPA 3015A							**Water**					
Blank (1070784-BLK1)			Prepared: 07/23/21 14:33		Analyzed: 07/26/21 19:27							
EPA 6020B												
Aluminum	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	
Arsenic	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	
Calcium	ND	300	600	ug/L	1	---	---	---	---	---	---	
Magnesium	ND	75.0	150	ug/L	1	---	---	---	---	---	---	
Potassium	ND	50.0	100	ug/L	1	---	---	---	---	---	---	
Sodium	ND	50.0	100	ug/L	1	---	---	---	---	---	---	
Lithium	ND	2.50	5.00	ug/L	1	---	---	---	---	---	---	
Blank (1070784-BLK2)			Prepared: 07/23/21 14:33		Analyzed: 07/26/21 19:32							
EPA 6020B												
Aluminum	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	A-01
Arsenic	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	A-01
Calcium	**773**	300	600	ug/L	1	---	---	---	---	---	---	A-01
Magnesium	**203**	75.0	150	ug/L	1	---	---	---	---	---	---	A-01
Potassium	**145**	50.0	100	ug/L	1	---	---	---	---	---	---	A-01
Sodium	**849**	50.0	100	ug/L	1	---	---	---	---	---	---	A-01
Lithium	ND	2.50	5.00	ug/L	1	---	---	---	---	---	---	A-01
LCS (1070784-BS1)			Prepared: 07/23/21 14:33		Analyzed: 07/26/21 19:37							
EPA 6020B												
Aluminum	2720	25.0	50.0	ug/L	1	2780	---	98	80-120%	---	---	
Arsenic	54.8	0.500	1.00	ug/L	1	55.6	---	99	80-120%	---	---	
Calcium	2750	300	600	ug/L	1	2780	---	99	80-120%	---	---	B
Magnesium	2760	75.0	150	ug/L	1	2780	---	99	80-120%	---	---	B
Potassium	2860	50.0	100	ug/L	1	2780	---	103	80-120%	---	---	B
Sodium	2880	50.0	100	ug/L	1	2780	---	104	80-120%	---	---	B
LCS (1070784-BS2)			Prepared: 07/23/21 14:33		Analyzed: 07/26/21 19:42							
EPA 6020B												
Lithium	41.2	2.50	5.00	ug/L	1	44.4	---	93	80-120%	---	---	
Duplicate (1070784-DUP1)			Prepared: 07/23/21 14:33		Analyzed: 07/26/21 20:24							

DRAFT REPORT

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ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1070784 - EPA 3015A							**Water**					
Duplicate (1070784-DUP1)			Prepared: 07/23/21 14:33	Analyzed: 07/26/21 20:24								
QC Source Sample: Non-SDG (A1G0664-03)												
Aluminum	**188**	141	281	ug/L	5	---	182	---	---	3	20%	R-03, R-04, J
Arsenic	**15.0**	2.81	5.62	ug/L	5	---	13.8	---	---	8	20%	
Calcium	**76700**	1690	3380	ug/L	5	---	77600	---	---	1	20%	EST, B
Magnesium	**23900**	422	844	ug/L	5	---	23500	---	---	2	20%	EST, B
Potassium	**17000**	281	562	ug/L	5	---	16700	---	---	1	20%	EST, B
Sodium	**22900**	281	562	ug/L	5	---	22500	---	---	2	20%	EST, B
Lithium	ND	14.1	28.1	ug/L	5	---	ND	---	---	---	20%	R-03, R-04
Matrix Spike (1070784-MS1)			Prepared: 07/23/21 14:33	Analyzed: 07/26/21 20:40								
QC Source Sample: Non-SDG (A1G0664-05)												
EPA 6020B												
Aluminum	3900	161	321	ug/L	5	3570	ND	109	75-125%	---	---	
Arsenic	116	3.21	6.43	ug/L	5	71.4	6.41	**154**	**75-125%**	---	---	Q-11
Calcium	5010	1930	3860	ug/L	5	3570	ND	**140**	**75-125%**	---	---	Q-11, B
Magnesium	5450	482	964	ug/L	5	3570	1670	106	75-125%	---	---	B
Potassium	28100	321	643	ug/L	5	3570	24300	107	75-125%	---	---	B
Sodium	7660	321	643	ug/L	5	3570	3830	107	75-125%	---	---	B
Matrix Spike (1070784-MS2)			Prepared: 07/23/21 14:33	Analyzed: 07/26/21 20:55								
QC Source Sample: Non-SDG (A1G0664-07)												
EPA 6020B												
Lithium	58.5	16.1	32.1	ug/L	5	57.1	ND	102	75-125%	---	---	

DRAFT REPORT

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ANALYTICAL REPORT

Anchor QEA, LLC	Project: Alabama Power-Gadsden	
6720 SW Macadam Ave. Suite 125	Project Number: 201114-03.02	Report ID:
Portland, OR 97219	Project Manager: Anthony Dalton-Atha	A1G0665 - 07 27 21 2116

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1070786 - EPA 3015A							Water					
Blank (1070786-BLK1)				Prepared: 07/23/21 15:08 Analyzed: 07/26/21 21:37								
EPA 6020B												
Aluminum	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	
Arsenic	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	
Calcium	ND	300	600	ug/L	1	---	---	---	---	---	---	
Magnesium	ND	75.0	150	ug/L	1	---	---	---	---	---	---	
Potassium	ND	50.0	100	ug/L	1	---	---	---	---	---	---	
Sodium	ND	50.0	100	ug/L	1	---	---	---	---	---	---	
Lithium	ND	2.50	5.00	ug/L	1	---	---	---	---	---	---	
LCS (1070786-BS1)				Prepared: 07/23/21 15:08 Analyzed: 07/26/21 21:42								
EPA 6020B												
Aluminum	2870	25.0	50.0	ug/L	1	2780	---	103	80-120%	---	---	
Arsenic	57.2	0.500	1.00	ug/L	1	55.6	---	103	80-120%	---	---	
Calcium	2840	300	600	ug/L	1	2780	---	102	80-120%	---	---	
Magnesium	2880	75.0	150	ug/L	1	2780	---	104	80-120%	---	---	
Potassium	2930	50.0	100	ug/L	1	2780	---	105	80-120%	---	---	
Sodium	3000	50.0	100	ug/L	1	2780	---	108	80-120%	---	---	
LCS (1070786-BS2)				Prepared: 07/23/21 15:08 Analyzed: 07/26/21 21:48								
EPA 6020B												
Lithium	42.3	2.50	5.00	ug/L	1	44.4	---	95	80-120%	---	---	
Duplicate (1070786-DUP1)				Prepared: 07/23/21 15:08 Analyzed: 07/26/21 22:29								
QC Source Sample: GSD-AP-CEC-7-20210722 (A1G0665-07)												
EPA 6020B												
Aluminum	ND	225	450	ug/L	5	---	ND	---	---	---	20%	R-03, R-04
Arsenic	ND	4.50	9.00	ug/L	5	---	ND	---	---	---	20%	R-03, R-04
Calcium	**94600**	2700	5400	ug/L	5	---	90400	---	---	5	20%	
Magnesium	**20400**	675	1350	ug/L	5	---	20400	---	---	0.1	20%	
Potassium	**19100**	450	900	ug/L	5	---	19000	---	---	0.6	20%	
Sodium	**3110**	450	900	ug/L	5	---	3150	---	---	1	20%	
Lithium	ND	22.5	45.0	ug/L	5	---	ND	---	---	---	20%	R-03, R-04

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6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1070786 - EPA 3015A							**Water**					
Matrix Spike (1070786-MS1)			Prepared: 07/23/21 15:08	Analyzed: 07/26/21 22:40								
QC Source Sample: GSD-AP-CEC-8-20210722 (A1G0665-08)												
EPA 6020B												
Aluminum	5380	225	450	ug/L	5	5000	ND	108	75-125%	---	---	
Arsenic	149	4.50	9.00	ug/L	5	100	8.74	**140**	**75-125%**	---	---	Q-11
Calcium	69700	2700	5400	ug/L	5	5000	62900	**136**	**75-125%**	---	---	Q-03
Magnesium	22000	675	1350	ug/L	5	5000	17000	100	75-125%	---	---	
Potassium	21300	450	900	ug/L	5	5000	16300	100	75-125%	---	---	
Sodium	7700	450	900	ug/L	5	5000	2400	106	75-125%	---	---	
Matrix Spike (1070786-MS2)			Prepared: 07/23/21 15:08	Analyzed: 07/26/21 22:50								
QC Source Sample: GSD-AP-CEC-9-20210722 (A1G0665-09)												
EPA 6020B												
Lithium	84.1	22.5	45.0	ug/L	5	80.0	ND	105	75-125%	---	---	R-03, R-04

DRAFT REPORT

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SAMPLE PREPARATION INFORMATION

Total Metals by EPA 6020B (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1070784							
A1G0665-01	Water	EPA 6020B	07/22/21 10:00	07/23/21 14:33	25mL/50mL	45mL/50mL	1.80
A1G0665-01RE1	Water	EPA 6020B	07/22/21 10:00	07/23/21 14:33	25mL/50mL	45mL/50mL	1.80
A1G0665-02	Water	EPA 6020B	07/22/21 10:05	07/23/21 14:33	25mL/50mL	45mL/50mL	1.80
A1G0665-02RE1	Water	EPA 6020B	07/22/21 10:05	07/23/21 14:33	25mL/50mL	45mL/50mL	1.80
Batch: 1070786							
A1G0665-03	Water	EPA 6020B	07/22/21 10:10	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-03RE1	Water	EPA 6020B	07/22/21 10:10	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-04	Water	EPA 6020B	07/22/21 10:15	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-05	Water	EPA 6020B	07/22/21 10:20	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-05RE1	Water	EPA 6020B	07/22/21 10:20	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-06	Water	EPA 6020B	07/22/21 10:25	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-07	Water	EPA 6020B	07/22/21 10:30	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-08	Water	EPA 6020B	07/22/21 10:35	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-09	Water	EPA 6020B	07/22/21 10:40	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-10	Water	EPA 6020B	07/22/21 10:45	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-11	Water	EPA 6020B	07/22/21 10:50	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-11RE1	Water	EPA 6020B	07/22/21 10:50	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-12	Water	EPA 6020B	07/22/21 10:55	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-12RE1	Water	EPA 6020B	07/22/21 10:55	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-13	Water	EPA 6020B	07/22/21 11:00	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-14	Water	EPA 6020B	07/22/21 11:05	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80
A1G0665-15	Water	EPA 6020B	07/22/21 11:10	07/23/21 15:08	25mL/50mL	45mL/50mL	1.80

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QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

A-01	This is a Blank prepared with Citranox to mirror the Citrinox contamination to sample A1G0664-03 and 1070784-DUP1.
B	Analyte detected in an associated blank at a level above the MRL. (See Notes and Conventions below.)
EST	Result reported as an Estimated Value. This sample had a small amount of Cirtranox introduced during preparation without sufficient volume to reprepare the sample. A blank prepared to check for Ciitranox contamination showed levels of Ca, K, Mg and Na th
J	Estimated Result. Result detected below the lowest point of the calibration curve, but above the specified MDL.
Q-03	Spike recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
Q-11	Spike recovery cannot be accurately quantified due to sample dilution required for high analyte concentration and/or matrix interference.
Q-42	Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits. (Refer to the QC Section of Analytical Report.)
R-03	Elevated Reporting Limits due to limited sample volume.
R-04	Reporting levels elevated due to preparation and/or analytical dilution necessary for analysis.

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.

ND Analyte NOT DETECTED at or above the detection or reporting limit.

NR Result Not Reported

RPD Relative Percent Difference. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.

" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.

"   " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) may not be included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

‘B’ and ‘B-02’ qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

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LABORATORY ACCREDITATION INFORMATION

ORELAP Certification ID: OR100062 (Primary Accreditation) -
EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
All reported analytes are included in Apex Laboratories' current ORELAP scope.					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

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A1G0665

Chain of Custody Record & Laboratory Analysis Request

Company: Anchor QEA
Date: 7/22/2021
Project Name: Alabama Power - Gadsden
Project Number: 201114-03.02
Project Manager: Anthony Dalton-Atha adalton-atha@anchorqea.com
Phone Number: 503-924-6186
Shipment Method: Pick-up
Samplers: Paloma Spina

ANCHOR QEA

2day TAT

Line	Field Sample ID	Collection Date/Time		Matrix	No. of Containers	As, Li, Ca,Mg, K, Na, Al,	Comments/Preservation
1	GSD-AP-CEC-1-20210722	7/22/2021	10:00	Water	1	x	1 Molar (M) ammonium acetate, pH 7
2	GSD-AP-CEC-2-20210722	7/22/2021	10:05	Water	1	x	1 Molar (M) ammonium acetate, pH 7
3	GSD-AP-CEC-3-20210722	7/22/2021	10:10	Water	1	x	1 Molar (M) ammonium acetate, pH 7
4	GSD-AP-CEC-4-20210722	7/22/2021	10:15	Water	1	x	1 Molar (M) ammonium acetate, pH 7
5	GSD-AP-CEC-5-20210722	7/22/2021	10:20	Water	1	x	1 Molar (M) ammonium acetate, pH 7
6	GSD-AP-CEC-6-20210722	7/22/2021	10:25	Water	1	x	1 Molar (M) ammonium acetate, pH 7
7	GSD-AP-CEC-7-20210722	7/22/2021	10:30	Water	1	x	1 Molar (M) ammonium acetate, pH 7
8	GSD-AP-CEC-8-20210722	7/22/2021	10:35	Water	1	x	1 Molar (M) ammonium acetate, pH 7
9	GSD-AP-CEC-9-20210722	7/22/2021	10:40	Water	1	x	1 Molar (M) ammonium acetate, pH 7
10	GSD-AP-CEC-10-20210722	7/22/2021	10:45	Water	1	x	1 Molar (M) ammonium acetate, pH 7
11	GSD-AP-CEC-11-20210722	7/22/2021	10:50	Water	1	x	1 Molar (M) ammonium acetate, pH 7
12	GSD-AP-CEC-12-20210722	7/22/2021	10:55	Water	1	x	1 Molar (M) ammonium acetate, pH 7
13	GSD-AP-CEC-13-20210722	7/22/2021	11:00	Water	1	x	1 Molar (M) ammonium acetate, pH 7
14	GSD-AP-CEC-14-20210722	7/22/2021	11:05	Water	1	x	1 Molar (M) ammonium acetate, pH 7
15	GSD-AP-CEC-MB-20210722	7/22/2021	11:10	Water	1	x	1 Molar (M) ammonium acetate, pH 7
16							1 Molar (M) ammonium acetate, pH 7

Comments: samples are filtered but not preserved.

Relinquished By: Anthony Dalton-Atha Company: Anchor QEA
Signature/Printed Name: [signature] Date/Time: 7/23/21 1205

Received By: Eli Jo[illegible] Company: APEX LABS
Signature/Printed Name: [signature] Date/Time: 7/23/21 1205

Relinquished By: Company:
Signature/Printed Name Date/Time

Received By: Company:
Signature/Printed Name Date/Time

Page 1 of 1

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory.

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: OR100062

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1G0665 - 07 27 21 2116**

APEX LABS COOLER RECEIPT FORM

Client: Anchor QEA Element WO#: A1 G0665

Project/Project #: Alabama Power - Gadsen 201114-03.02

Delivery Info:

Date/time received: 7/23/21 @ 1205 By: EJ

Delivered by: Apex X Client___ ESS___ FedEx___ UPS___ Swift___ Senvoy___ SDS___ Other___

Cooler Inspection Date/time inspected: 7/23/21 @ 1253 By: EJ

Chain of Custody included? Yes X No ___ Custody seals? Yes X No ___

Signed/dated by client? Yes X No ___

Signed/dated by Apex? Yes X No ___

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	2.2						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	N						
Ice type: (Gel/Real/Other)	Real						
Condition:	Good						

Cooler out of temp? (Y/N) N Possible reason why:

Green dots applied to out of temperature samples? Yes/No No

Out of temperature samples form initiated? Yes/No No

Sample Inspection: Date/time inspected: 7/23/21 @ 13:40 By: TAM

All samples intact? Yes X No ___ Comments:

Bottle labels/COCs agree? Yes X No ___ Comments:

COC/container discrepancies form initiated? Yes ___ No X

Containers/volumes received appropriate for analysis? Yes X No ___ Comments: Samples -01 to -04 limited volume

Do VOA vials have visible headspace? Yes ___ No ___ NA X

Comments

Water samples: pH checked: Yes___No___NA X pH appropriate? Yes___No___NA X

Comments:

Additional information:

Labeled by: TAM Witness: WAS Cooler Inspected by: TAM

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Sunday, September 12, 2021

Anthony Dalton-Atha
Anchor QEA, LLC
6720 SW Macadam Ave. Suite 125
Portland, OR 97219

RE: A1H0233 - Alabama Power-Gadsden - 201114-03.02

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A1H0233, which was received by the laboratory on 8/6/2021 at 3:30:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: dthomas@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of sample receipt, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1 3.0 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GSD-AP-AAO-1-20210804	A1H0233-01	Water	08/04/21 10:00	08/06/21 15:30
GSD-AP-AAO-2-20210804	A1H0233-02	Water	08/04/21 10:05	08/06/21 15:30
GSD-AP-AAO-3-20210804	A1H0233-03	Water	08/04/21 10:10	08/06/21 15:30
GSD-AP-AAO-4-20210804	A1H0233-04	Water	08/04/21 10:15	08/06/21 15:30
GSD-AP-AAO-5-20210804	A1H0233-05	Water	08/04/21 10:20	08/06/21 15:30
GSD-AP-AAO-6-20210804	A1H0233-06	Water	08/04/21 10:25	08/06/21 15:30
GSD-AP-AAO-7-20210804	A1H0233-07	Water	08/04/21 10:30	08/06/21 15:30
GSD-AP-AAO-8-20210804	A1H0233-08	Water	08/04/21 10:35	08/06/21 15:30
GSD-AP-AAO-9-20210804	A1H0233-09	Water	08/04/21 10:40	08/06/21 15:30
GSD-AP-AAO-10-20210804	A1H0233-10	Water	08/04/21 10:45	08/06/21 15:30
GSD-AP-AAO-11-20210804	A1H0233-11	Water	08/04/21 10:50	08/06/21 15:30
GSD-AP-AAO-12-20210804	A1H0233-12	Water	08/04/21 10:55	08/06/21 15:30
GSD-AP-AAO-13-20210804	A1H0233-13	Water	08/04/21 11:00	08/06/21 15:30
GSD-AP-AAO-14-20210804	A1H0233-14	Water	08/04/21 11:05	08/06/21 15:30
GSD-AP-AAO-MB-20210804	A1H0233-15	Water	08/04/21 11:10	08/06/21 15:30

Apex Laboratories

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Darwin Thomas, Business Development Director

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Anchor QEA, LLC **6720 SW Macadam Ave. Suite 125** **Portland, OR 97219**	Project: **Alabama Power-Gadsden** Project Number: **201114-03.02** Project Manager: **Anthony Dalton-Atha**	**Report ID:** **A1H0233 - 09 12 21 0614**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-AAO-1-20210804 (A1H0233-01)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**11400**	150	300	ug/L	5	08/11/21 03:43	EPA 6020B	
Arsenic	**41600**	3.00	6.00	ug/L	5	08/11/21 03:43	EPA 6020B	**E**
Iron	**309000**	150	300	ug/L	5	08/11/21 03:43	EPA 6020B	
Manganese	**8550**	3.00	6.00	ug/L	5	08/11/21 03:43	EPA 6020B	**E**
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 03:43	EPA 6020B	R-04
GSD-AP-AAO-2-20210804 (A1H0233-02)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**7790**	150	300	ug/L	5	08/11/21 03:58	EPA 6020B	
Arsenic	**56.0**	3.00	6.00	ug/L	5	08/11/21 03:58	EPA 6020B	
Iron	**161000**	150	300	ug/L	5	08/11/21 03:58	EPA 6020B	
Manganese	**8220**	3.00	6.00	ug/L	5	08/11/21 03:58	EPA 6020B	**E**
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 03:58	EPA 6020B	R-04
GSD-AP-AAO-3-20210804 (A1H0233-03)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**4050**	150	300	ug/L	5	08/11/21 04:02	EPA 6020B	
Arsenic	**11.2**	3.00	6.00	ug/L	5	08/11/21 04:02	EPA 6020B	**B-02**
Iron	**34300**	150	300	ug/L	5	08/11/21 04:02	EPA 6020B	
Manganese	**1450**	3.00	6.00	ug/L	5	08/11/21 04:02	EPA 6020B	
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:02	EPA 6020B	R-04
GSD-AP-AAO-4-20210804 (A1H0233-04)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**4930**	150	300	ug/L	5	08/11/21 04:07	EPA 6020B	
Arsenic	**287**	3.00	6.00	ug/L	5	08/11/21 04:07	EPA 6020B	
Iron	**297000**	150	300	ug/L	5	08/11/21 04:07	EPA 6020B	
Manganese	**2520**	3.00	6.00	ug/L	5	08/11/21 04:07	EPA 6020B	
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:07	EPA 6020B	R-04
GSD-AP-AAO-5-20210804 (A1H0233-05)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**8750**	150	300	ug/L	5	08/11/21 04:12	EPA 6020B	
Arsenic	**185**	3.00	6.00	ug/L	5	08/11/21 04:12	EPA 6020B	

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Darwin Thomas, Business Development Director

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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ORELAP ID: **OR100062**

ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-AAO-5-20210804 (A1H0233-05)				**Matrix: Water**				
Iron	**540000**	150	300	ug/L	5	08/11/21 04:12	EPA 6020B	**E**
Manganese	**6020**	3.00	6.00	ug/L	5	08/11/21 04:12	EPA 6020B	
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:12	EPA 6020B	R-04
GSD-AP-AAO-6-20210804 (A1H0233-06)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**6470**	150	300	ug/L	5	08/11/21 04:17	EPA 6020B	
Arsenic	**140**	3.00	6.00	ug/L	5	08/11/21 04:17	EPA 6020B	
Iron	**343000**	150	300	ug/L	5	08/11/21 04:17	EPA 6020B	**E**
Manganese	**2540**	3.00	6.00	ug/L	5	08/11/21 04:17	EPA 6020B	
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:17	EPA 6020B	R-04
GSD-AP-AAO-7-20210804 (A1H0233-07)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**17600**	150	300	ug/L	5	08/11/21 04:22	EPA 6020B	
Arsenic	**34.6**	3.00	6.00	ug/L	5	08/11/21 04:22	EPA 6020B	
Iron	**14900**	150	300	ug/L	5	08/11/21 04:22	EPA 6020B	
Manganese	**1580**	3.00	6.00	ug/L	5	08/11/21 04:22	EPA 6020B	
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:22	EPA 6020B	R-04
GSD-AP-AAO-8-20210804 (A1H0233-08)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**15000**	150	300	ug/L	5	08/11/21 04:27	EPA 6020B	
Arsenic	**32.1**	3.00	6.00	ug/L	5	08/11/21 04:27	EPA 6020B	
Iron	**12700**	150	300	ug/L	5	08/11/21 04:27	EPA 6020B	
Manganese	**1390**	3.00	6.00	ug/L	5	08/11/21 04:27	EPA 6020B	
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:27	EPA 6020B	R-04
GSD-AP-AAO-9-20210804 (A1H0233-09)				**Matrix: Water**				
Batch: 1080275								
Aluminum	**15200**	150	300	ug/L	5	08/11/21 04:32	EPA 6020B	
Arsenic	**18.5**	3.00	6.00	ug/L	5	08/11/21 04:32	EPA 6020B	**B-02**
Iron	**12100**	150	300	ug/L	5	08/11/21 04:32	EPA 6020B	
Manganese	**1050**	3.00	6.00	ug/L	5	08/11/21 04:32	EPA 6020B	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC	Project: Alabama Power-Gadsden	
6720 SW Macadam Ave. Suite 125	Project Number: 201114-03.02	Report ID:
Portland, OR 97219	Project Manager: Anthony Dalton-Atha	A1H0233 - 09 12 21 0614

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-AAO-9-20210804 (A1H0233-09)				Matrix: Water				
Lithium	ND	15.0	30.0	ug/L	5	08/11/21 04:32	EPA 6020B	R-04
GSD-AP-AAO-10-20210804 (A1H0233-10)				Matrix: Water				
Batch: 1080276								
Aluminum	**7350**	161	321	ug/L	5	08/11/21 05:11	EPA 6020B	
Arsenic	**14.2**	3.21	6.43	ug/L	5	08/11/21 05:11	EPA 6020B	
Iron	**6220**	161	321	ug/L	5	08/11/21 05:11	EPA 6020B	
Manganese	**488**	3.21	6.43	ug/L	5	08/11/21 05:11	EPA 6020B	
Lithium	ND	16.1	32.1	ug/L	5	08/11/21 05:11	EPA 6020B	R-04
GSD-AP-AAO-11-20210804 (A1H0233-11)				Matrix: Water				
Batch: 1080276								
Aluminum	**7970**	161	321	ug/L	5	08/11/21 05:16	EPA 6020B	
Arsenic	**6.09**	3.21	6.43	ug/L	5	08/11/21 05:16	EPA 6020B	**J, R-04**
Iron	**12400**	161	321	ug/L	5	08/11/21 05:16	EPA 6020B	
Manganese	**394**	3.21	6.43	ug/L	5	08/11/21 05:16	EPA 6020B	
Lithium	ND	16.1	32.1	ug/L	5	08/11/21 05:16	EPA 6020B	R-04
GSD-AP-AAO-12-20210804 (A1H0233-12)				Matrix: Water				
Batch: 1080276								
Aluminum	**10800**	161	321	ug/L	5	08/11/21 05:21	EPA 6020B	
Arsenic	**17.5**	3.21	6.43	ug/L	5	08/11/21 05:21	EPA 6020B	
Iron	**29200**	161	321	ug/L	5	08/11/21 05:21	EPA 6020B	
Manganese	**7320**	3.21	6.43	ug/L	5	08/11/21 05:21	EPA 6020B	**E**
Lithium	ND	16.1	32.1	ug/L	5	08/11/21 05:21	EPA 6020B	R-04
GSD-AP-AAO-13-20210804 (A1H0233-13)				Matrix: Water				
Batch: 1080276								
Aluminum	**14700**	161	321	ug/L	5	08/11/21 05:26	EPA 6020B	
Arsenic	**28.2**	3.21	6.43	ug/L	5	08/11/21 05:26	EPA 6020B	
Iron	**31600**	161	321	ug/L	5	08/11/21 05:26	EPA 6020B	
Manganese	**19200**	3.21	6.43	ug/L	5	08/11/21 05:26	EPA 6020B	**E**
Lithium	**19.2**	16.1	32.1	ug/L	5	08/11/21 05:26	EPA 6020B	**J, R-04**
GSD-AP-AAO-14-20210804 (A1H0233-14)				Matrix: Water				

APEX LABORATORIES

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
GSD-AP-AAO-14-20210804 (A1H0233-14)				Matrix: Water				
Batch: 1080276								
Aluminum	**15900**	161	321	ug/L	5	08/11/21 05:31	EPA 6020B	
Arsenic	**23.4**	3.21	6.43	ug/L	5	08/11/21 05:31	EPA 6020B	
Iron	**38900**	161	321	ug/L	5	08/11/21 05:31	EPA 6020B	
Manganese	**23400**	3.21	6.43	ug/L	5	08/11/21 05:31	EPA 6020B	**E**
Lithium	**18.5**	16.1	32.1	ug/L	5	08/11/21 05:31	EPA 6020B	**J, R-04**
GSD-AP-AAO-MB-20210804 (A1H0233-15)				Matrix: Water				
Batch: 1080276								
Aluminum	ND	161	321	ug/L	5	08/11/21 05:36	EPA 6020B	R-04
Arsenic	ND	3.21	6.43	ug/L	5	08/11/21 05:36	EPA 6020B	R-04
Iron	ND	161	321	ug/L	5	08/11/21 05:36	EPA 6020B	R-04
Manganese	**4.42**	3.21	6.43	ug/L	5	08/11/21 05:36	EPA 6020B	**J, R-04**
Lithium	ND	16.1	32.1	ug/L	5	08/11/21 05:36	EPA 6020B	R-04

Apex Laboratories

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Darwin Thomas, Business Development Director

APEX LABORATORIES

ANALYTICAL REPORT

Apex Laboratories, LLC
6700 S.W. Sandburg Street
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503-718-2323
ORELAP ID: OR100062

Anchor QEA, LLC 6720 SW Macadam Ave. Suite 125 Portland, OR 97219	Project: Alabama Power-Gadsden Project Number: 201114-03.02 Project Manager: Anthony Dalton-Atha	Report ID: A1H0233 - 09 12 21 0614

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1080275 - EPA 3015A							**Water**					
Blank (1080275-BLK1)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 03:26								
EPA 6020B												
Aluminum	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	
Arsenic	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	
Iron	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	
Manganese	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	
Blank (1080275-BLK2)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 02:29								
EPA 6020B												
Lithium	ND	2.50	5.00	ug/L	1	---	---	---	---	---	---	
LCS (1080275-BS1)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 03:31								
EPA 6020B												
Aluminum	2770	25.0	50.0	ug/L	1	2780	---	100	80-120%	---	---	
Arsenic	56.7	0.500	1.00	ug/L	1	55.6	---	102	80-120%	---	---	
Iron	2780	25.0	50.0	ug/L	1	2780	---	100	80-120%	---	---	
Manganese	56.2	0.500	1.00	ug/L	1	55.6	---	101	80-120%	---	---	
LCS (1080275-BS2)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 02:34								
EPA 6020B												
Lithium	44.0	2.50	5.00	ug/L	1	44.4	---	99	80-120%	---	---	
Duplicate (1080275-DUP1)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 03:41								
QC Source Sample: Non-SDG (A1H0231-01)												
Aluminum	ND	25.0	50.0	ug/L	1	---	ND	---	---	---	20%	
Arsenic	**1.32**	0.500	1.00	ug/L	1	---	1.32	---	---	0.08	20%	
Iron	**126**	25.0	50.0	ug/L	1	---	121	---	---	4	20%	
Manganese	**9.23**	0.500	1.00	ug/L	1	---	9.07	---	---	2	20%	
Duplicate (1080275-DUP2)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 03:33								
QC Source Sample: Non-SDG (A1H0231-01)												
Lithium	ND	25.0	50.0	ug/L	10	---	ND	---	---	---	20%	R-04
Matrix Spike (1080275-MS1)			Prepared: 08/10/21 08:50	Analyzed: 08/11/21 03:46								

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ORELAP ID: **OR100062**

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1080275 - EPA 3015A							**Water**					
Matrix Spike (1080275-MS1)			Prepared: 08/10/21 08:50 Analyzed: 08/11/21 03:46									
QC Source Sample: Non-SDG (A1H0231-01)												
EPA 6020B												
Aluminum	2810	25.0	50.0	ug/L	1	2780	ND	101	75-125%	---	---	
Arsenic	59.7	0.500	1.00	ug/L	1	55.6	1.32	105	75-125%	---	---	
Iron	2950	25.0	50.0	ug/L	1	2780	121	102	75-125%	---	---	
Manganese	64.9	0.500	1.00	ug/L	1	55.6	9.07	100	75-125%	---	---	
Matrix Spike (1080275-MS2)			Prepared: 08/10/21 08:50 Analyzed: 08/11/21 03:38									
QC Source Sample: Non-SDG (A1H0231-01)												
EPA 6020B												
Lithium	44.0	25.0	50.0	ug/L	10	44.4	ND	99	75-125%	---	---	R-04, J

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ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1080276 - EPA 3015A							**Water**					
Blank (1080276-BLK1)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 02:47								
EPA 6020B												
Aluminum	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	
Arsenic	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	
Iron	ND	25.0	50.0	ug/L	1	---	---	---	---	---	---	
Manganese	ND	0.500	1.00	ug/L	1	---	---	---	---	---	---	
Blank (1080276-BLK2)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 04:42								
EPA 6020B												
Lithium	ND	2.50	5.00	ug/L	1	---	---	---	---	---	---	
LCS (1080276-BS1)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 03:02								
EPA 6020B												
Aluminum	2760	25.0	50.0	ug/L	1	2780	---	99	80-120%	---	---	
Arsenic	55.8	0.500	1.00	ug/L	1	55.6	---	100	80-120%	---	---	
Iron	2800	25.0	50.0	ug/L	1	2780	---	101	80-120%	---	---	
Manganese	55.5	0.500	1.00	ug/L	1	55.6	---	100	80-120%	---	---	
LCS (1080276-BS2)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 04:57								
EPA 6020B												
Lithium	43.8	2.50	5.00	ug/L	1	44.4	---	99	80-120%	---	---	
Duplicate (1080276-DUP1)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 03:12								
QC Source Sample: Non-SDG (A1H0131-01)												
Aluminum	**32.1**	25.0	50.0	ug/L	1	---	ND	---	---		**20%**	J, Q-05
Arsenic	**0.591**	0.500	1.00	ug/L	1	---	0.570	---	---	4	20%	J
Iron	**73.8**	25.0	50.0	ug/L	1	---	67.4	---	---	9	20%	
Manganese	**16.7**	0.500	1.00	ug/L	1	---	17.0	---	---	1	20%	
Duplicate (1080276-DUP2)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 05:06								
QC Source Sample: Non-SDG (A1H0131-01)												
Lithium	ND	12.5	25.0	ug/L	5	---	ND	---	---	---	20%	R-04
Matrix Spike (1080276-MS1)			Prepared: 08/10/21 09:02	Analyzed: 08/11/21 03:17								

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QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 1080276 - EPA 3015A							**Water**					
Matrix Spike (1080276-MS1)			Prepared: 08/10/21 09:02 Analyzed: 08/11/21 03:17									
QC Source Sample: Non-SDG (A1H0131-01)												
EPA 6020B												
Aluminum	2730	25.0	50.0	ug/L	1	2780	ND	98	75-125%	---	---	
Arsenic	56.7	0.500	1.00	ug/L	1	55.6	0.570	101	75-125%	---	---	
Iron	2800	25.0	50.0	ug/L	1	2780	67.4	98	75-125%	---	---	
Manganese	70.2	0.500	1.00	ug/L	1	55.6	17.0	96	75-125%	---	---	
Matrix Spike (1080276-MS2)			Prepared: 08/10/21 09:02 Analyzed: 08/11/21 06:35									
QC Source Sample: Non-SDG (A1H0239-01)												
EPA 6020B												
Lithium	ND	125	250	ug/L	50	44.4	ND		**75-125%**	---	---	Q-11, R-04

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ANALYTICAL REPORT

Anchor QEA, LLC	Project: **Alabama Power-Gadsden**	
6720 SW Macadam Ave. Suite 125	Project Number: **201114-03.02**	**Report ID:**
Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

SAMPLE PREPARATION INFORMATION

Total Metals by EPA 6020B (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1080275							
A1H0233-01	Water	EPA 6020B	08/04/21 10:00	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-02	Water	EPA 6020B	08/04/21 10:05	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-03	Water	EPA 6020B	08/04/21 10:10	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-04	Water	EPA 6020B	08/04/21 10:15	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-05	Water	EPA 6020B	08/04/21 10:20	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-06	Water	EPA 6020B	08/04/21 10:25	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-07	Water	EPA 6020B	08/04/21 10:30	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-08	Water	EPA 6020B	08/04/21 10:35	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
A1H0233-09	Water	EPA 6020B	08/04/21 10:40	08/10/21 08:50	37.5mL/50mL	45mL/50mL	1.20
Batch: 1080276							
A1H0233-10	Water	EPA 6020B	08/04/21 10:45	08/10/21 09:02	35mL/50mL	45mL/50mL	1.29
A1H0233-11	Water	EPA 6020B	08/04/21 10:50	08/10/21 09:02	35mL/50mL	45mL/50mL	1.29
A1H0233-12	Water	EPA 6020B	08/04/21 10:55	08/10/21 09:02	35mL/50mL	45mL/50mL	1.29
A1H0233-13	Water	EPA 6020B	08/04/21 11:00	08/10/21 09:02	35mL/50mL	45mL/50mL	1.29
A1H0233-14	Water	EPA 6020B	08/04/21 11:05	08/10/21 09:02	35mL/50mL	45mL/50mL	1.29
A1H0233-15	Water	EPA 6020B	08/04/21 11:10	08/10/21 09:02	35mL/50mL	45mL/50mL	1.29

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Portland, OR 97219	Project Manager: **Anthony Dalton-Atha**	**A1H0233 - 09 12 21 0614**

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

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B-02	Analyte detected in an associated blank at a level between one-half the MRL and the MRL. (See Notes and Conventions below.)
E	Estimated Value. The result is above the calibration range of the instrument.
J	Estimated Result. Result detected below the lowest point of the calibration curve, but above the specified MDL.
Q-05	Analyses are not controlled on RPD values from sample and duplicate concentrations that are below 5 times the reporting level.
Q-11	Spike recovery cannot be accurately quantified due to sample dilution required for high analyte concentration and/or matrix interference.
R-04	Reporting levels elevated due to preparation and/or analytical dilution necessary for analysis.

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.
ND Analyte NOT DETECTED at or above the detection or reporting limit.
NR Result Not Reported
RPD Relative Percent Difference. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) may not be included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a ‘B-02’ qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a ‘B’ qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

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Darwin Thomas, Business Development Director

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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

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LABORATORY ACCREDITATION INFORMATION

ORELAP Certification ID: OR100062 (Primary Accreditation) -
EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation

All reported analytes are included in Apex Laboratories' current ORELAP scope.

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

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A1H0233

Chain of Custody Record & Laboratory Analysis Request

Company: Anchor QEA
Date: 8/4/2021
Project Name: Alabama Power - Gadsden
Project Number: 201114-03.02
Project Manager: Anthony Dalton-Atha adalton-atha@anchorqea.com
Phone Number: 503-924-6186
Shipment Method: Pick-up
Samplers: Modi Raduma

ANCHOR QEA

3day TAT

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	As, Li, Fe, Al, Mn	Comments/Preservation
1	GSD-AP-AAO-1-20210804	8/4/201 10:00:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
2	GSD-AP-AAO-2-20210804	8/4/201 10:05:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
3	GSD-AP-AAO-3-20210804	8/4/201 10:10:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
4	GSD-AP-AAO-4-20210804	8/4/201 10:15:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
5	GSD-AP-AAO-5-20210804	8/4/201 10:20:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
6	GSD-AP-AAO-6-20210804	8/4/201 10:25:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
7	GSD-AP-AAO-7-20210804	8/4/201 10:30:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
8	GSD-AP-AAO-8-20210804	8/4/201 10:35:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
9	GSD-AP-AAO-9-20210804	8/4/201 10:40:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
10	GSD-AP-AAO-10-20210804	8/4/201 10:45:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
11	GSD-AP-AAO-11-20210804	8/4/201 10:50:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
12	GSD-AP-AAO-12-20210804	8/4/201 10:55:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
13	GSD-AP-AAO-13-20210804	8/4/201 11:00:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
14	GSD-AP-AAO-14-20210804	8/4/201 11:05:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
15	GSD-AP-AAO-MB-20210804	8/4/201 11:10:00 AM	Water	1	x	0.2 M ammonium oxalate in 0.1 M oxalic acid
16						

Comments: samples are filtered and preserved with nitric acid.

Relinquished By: [signature] Company: AQEA	Received By: [signature] Company: Apex
Signature/Printed Name: Anthony Dalton-Atha Date/Time: 8/6/21 1300	Signature/Printed Name: Susan Ehat Date/Time: 8/6/21 ~~1300~~ 1530 SE 8/6/21
Relinquished By: Company:	Received By: Company:
Signature/Printed Name Date/Time	Signature/Printed Name Date/Time

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APEX LABS COOLER RECEIPT FORM

Client: Anchor QEA Element WO#: A1 H0233

Project/Project #: Alabama Power - Gadsden / 201114-03.02

Delivery Info:

Date/time received: 8/6/21 @ 1530 By: 8O

Delivered by: Apex____Client X ESS____FedEx____UPS____Swift___Senvoy ___SDS___Other____

Cooler Inspection Date/time inspected: 8/6/21 @ 1535 By: 8O

Chain of Custody included? Yes X No ___ Custody seals? Yes___ No X

Signed/dated by client? Yes X No ___

Signed/dated by Apex? Yes X No ___

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	3.0						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	Y						
Ice type: (Gel/Real/Other)	real						
Condition:	good						

Cooler out of temp? (Y/N) Possible reason why:____

Green dots applied to out of temperature samples? Yes/No

Out of temperature samples form initiated? Yes/No

Sample Inspection: Date/time inspected: 8/6/21 @ 1300 By: 8O

All samples intact? Yes X No ___ Comments:____

Bottle labels/COCs agree? Yes X No ___ Comments:____

COC/container discrepancies form initiated? Yes ___ No X

Containers/volumes received appropriate for analysis? Yes X No ___ Comments:____

Do VOA vials have visible headspace? Yes ___ No ___ NA X

Comments____

Water samples: pH checked: Yes___No___NA X pH appropriate? Yes___No___NA X

Comments:____

Additional information:____

Labeled by: 8O Witness: JJ Cooler Inspected by: 8O

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April 14, 2021

Analytical Report for Service Request No: K2103532

Masa Kanematsu
Anchor QEA, LLC
6720 SW Macadam Avenue
Suite 125
Portland, OR 97219

RE: CCR-GSD / 201114-03.02 Task 02

Dear Masa,

Enclosed are the results of the sample(s) submitted to our laboratory April 07, 2021
For your reference, these analyses have been assigned our service request number **K2103532.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris
Project Manager

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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
  DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
  DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- \+ The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
  DOD-QSM 4.2 definition : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Case Narrative

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ALS Environmental

Client: Anchor QEA, LLC
Project: CCR-GSD
Sample Matrix: Water

Service Request: K2103532
Date Received: 04/07/2021

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level II requested by the client.

Sample Receipt:

One water sample was received for analysis at ALS Environmental on 04/07/2021. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The sample was stored at minimum in accordance with the analytical method requirements.

Metals:

No significant anomalies were noted with this analysis.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by [signature] Date 04/14/2021

Chain of Custody

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K2103532

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	4/6/2021
Project Name:	CCR-GSD
Project Number:	201114-03.02 Task 02
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (Masa Kanematsu)
Shipment Method:	Fedex Overnight

ANCHOR QEA

Jessica Goin
6720 SW Macadam Ave
Suite 125
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Dissolved metals	Total metals (Al, Fe, Mn)	Anions	Ortho-Phosphate	Alkalinity	Total Organic Carbon	Ammonia as N									Comments/Preservation
1	GSD-COL-INF-20210406	4/6/3021	14:00	Water	1	X	X	X	X	X	X	X									HNO_3 preserved, filtered
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					
13																					
14																					
15																					

Notes: **Please analyze all analytes with Standard TAT on this page. Estimated concentrations As: < 300 ug/L, Mo: < 200 ug/L, B: < 1 mg/L**

Dissolved metals: Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Fe, Pb, Li, Mg, Mn, Mo, Ni, K, Se, Si, Ag, Na, Tl, Zn), Anions (Cl, F, nitrate, nitrite, Sulfate)

Relinquished by:	Company:
Masa Kanematsu	Anchor QEA
Signature/Print Name:	Date/Time:
	4/6/2020 16:00

Received by:	Company:
	ALS 4/7/21 1030
Signature/Print Name:	Date/Time:

Relinquished by:	Company:
Signature/Print Name:	Date/Time:

Received by:	Company:
Signature/Print Name:	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Page 1 of 1

PM M H

Cooler Receipt and Preservation Form

Client Anchor QEA Service Request K21 03532

Received: 4/7/21 Opened: 4/7/21 By: K Unloaded: 4/7/21 By: K

1. Samples were received via? *USPS* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* ______ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? ______
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N
4. Was a Temperature Blank present in cooler? NA Y N If yes, notate the temperature in the appropriate column below:
   If no, take the temperature of a representative sample bottle contained within the cooler; notate in the column "Sample Temp":
5. Were samples received within the method specified temperature ranges? NA Y N
   If no, were they received on ice and same day as collected? If not, notate the cooler # below and notify the PM. NA Y N

If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed* N/A For Metals

Temp Blank	Sample Temp	IR Gun	Cooler #/COC ID / NA	Out of temp indicate with "X"	PM Notified If out of temp	Tracking Number NA	Filed
16.2		IR01		—	—	773370505760	

6. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* Melted Ice
7. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
8. Were samples received in good condition (unbroken) NA Y N
9. Were all sample labels complete (ie, analysis, preservation, etc.)? NA Y N
10. Did all sample labels and tags agree with custody papers? NA Y N
11. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
12. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
13. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
14. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, Resolutions:

SHORT HOLD TIME

General Chemistry

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Chloride

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	**2.06**	0.20	0.02	2	04/07/21 18:05	
Method Blank	K2103532-MB	ND U	0.10	0.007	1	04/07/21 14:18	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/07/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Chloride

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	718939

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	5.00	5.00	100	90-110

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Fluoride

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	**0.44**	0.20	0.01	2	04/07/21 18:05	
Method Blank	K2103532-MB	ND U	0.10	0.005	1	04/07/21 14:18	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/07/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Fluoride

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	718939

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	4.70	5.00	94	90-110

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Nitrite as Nitrogen

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	ND U	0.10	0.006	2	04/07/21 18:05	
Method Blank	K2103532-MB	ND U	0.050	0.003	1	04/07/21 14:18	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/07/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Nitrite as Nitrogen

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	718939

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	2.44	2.50	98	90-110

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	ND U	0.10	0.02	2	04/07/21 18:05	
Method Blank	K2103532-MB	ND U	0.050	0.007	1	04/07/21 14:18	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/07/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Nitrate as Nitrogen

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	718939

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	2.41	2.50	97	90-110

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Sulfate

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	**136**	0.40	0.04	2	04/07/21 18:05	
Method Blank	K2103532-MB	ND U	0.20	0.02	1	04/07/21 14:18	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/07/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Sulfate

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	718939

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	4.94	5.00	99	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	350.1	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
GSD-COL-INF-20210406	K2103532-001	**0.549**	0.050	1	04/08/21 12:58	4/8/21	
Method Blank	K2103532-MB	ND U	0.050	1	04/08/21 12:58	4/8/21	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/08/21
Sample Matrix:	Water	**Date Extracted:**	04/08/21

Lab Control Sample Summary
Ammonia as Nitrogen

Analysis Method:	350.1	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	719137

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	5.64	5.36	105	86-114

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dba ALS Environmental

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	SM 2320 B	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Alkalinity as $CaCO_3$, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	**117**	15	3	1	04/12/21 13:58	
Method Blank	K2103532-MB	**6 J**	15	3	1	04/12/21 13:58	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/12/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Alkalinity as CaCO3, Total

Analysis Method:	SM 2320 B	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	719373

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	38.4	37	103	90-110
Lab Control Sample	K2103532-LCS2	38.3	37	103	90-110

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/6/21
Sample Matrix:	Water	**Date Received:**	04/7/21
Analysis Method:	SM 4500-P E	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Orthophosphate as Phosphorus

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	ND U	0.050	0.020	1	04/08/21 09:05	
Method Blank	K2103532-MB	ND U	0.050	0.020	1	04/08/21 09:05	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/08/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Orthophosphate as Phosphorus

Analysis Method:	SM 4500-P E	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	719112

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	1.45	1.57	92	85-115

Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/6/21
Sample Matrix:	Water		**Date Received:**	04/7/21
Analysis Method:	SM 5310 C		**Units:**	mg/L
Prep Method:	None		**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GSD-COL-INF-20210406	K2103532-001	**0.62**	0.50	0.07	1	04/13/21 18:46	
Method Blank	K2103532-MB	ND U	0.50	0.07	1	04/13/21 18:46	

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	04/13/21
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	719649

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K2103532-LCS1	23.7	25.0	95	83-117

Metals

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/06/21 14:00
Sample Matrix:	Water		**Date Received:**	04/07/21 10:30
Sample Name:	GSD-COL-INF-20210406		**Basis:**	NA
Lab Code:	K2103532-001			

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	6010C	ND	U	ug/L	21	5	1	04/13/21 11:10	04/09/21	
Antimony	6010C	ND	U	ug/L	21	7	1	04/13/21 11:10	04/09/21	
Arsenic	6010C	**197**		ug/L	21	5	1	04/13/21 11:10	04/09/21	
Barium	6010C	**61.6**		ug/L	4.2	0.9	1	04/13/21 11:10	04/09/21	
Beryllium	6010C	ND	U	ug/L	1.1	0.3	1	04/13/21 11:10	04/09/21	
Boron	6010C	**440**		ug/L	21	3	1	04/13/21 11:10	04/09/21	
Cadmium	6010C	ND	U	ug/L	1.1	0.4	1	04/13/21 11:10	04/09/21	
Calcium	6010C	**62300**		ug/L	21	3	1	04/13/21 11:10	04/09/21	
Chromium	6010C	ND	U	ug/L	8.4	2.1	1	04/13/21 11:10	04/09/21	
Cobalt	6010C	**28.1**		ug/L	2.1	0.7	1	04/13/21 11:10	04/09/21	
Iron	6010C	**5880**		ug/L	21	8	1	04/13/21 11:10	04/09/21	
Lead	6010C	ND	U	ug/L	11	3	1	04/13/21 11:10	04/09/21	
Lithium	6010C	**30**		ug/L	21	6	1	04/13/21 11:10	04/09/21	
Magnesium	6010C	**10200**		ug/L	5.3	0.4	1	04/13/21 11:10	04/09/21	
Manganese	6010C	**8940**		ug/L	1.1	0.2	1	04/13/21 11:10	04/09/21	
Molybdenum	6010C	**13.4**		ug/L	8.4	2.1	1	04/13/21 11:10	04/09/21	
Nickel	6010C	**4.4**		ug/L	4.2	0.9	1	04/13/21 11:10	04/09/21	
Potassium	6010C	**6670**		ug/L	210	60	1	04/13/21 11:10	04/09/21	
Selenium	6010C	ND	U	ug/L	21	7	1	04/13/21 11:10	04/09/21	
Silicon	6010C	**4660**		ug/L	210	30	1	04/13/21 11:10	04/09/21	
Silver	6010C	ND	U	ug/L	8.4	2.1	1	04/13/21 11:10	04/09/21	
Sodium	6010C	**4860**		ug/L	210	30	1	04/13/21 11:10	04/09/21	
Thallium	6010C	ND	U	ug/L	11	4	1	04/13/21 11:10	04/09/21	
Zinc	6010C	**1.4**	**J**	ug/L	4.2	0.5	1	04/13/21 11:10	04/09/21	

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Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2103532
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/06/21 14:00
Sample Matrix:	Water	**Date Received:**	04/07/21 10:30
Sample Name:	GSD-COL-INF-20210406	**Basis:**	NA
Lab Code:	K2103532-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	6010C	ND U	ug/L	21	5	1	04/13/21 11:00	04/09/21	
Iron	6010C	**11700**	ug/L	21	8	1	04/13/21 11:00	04/09/21	
Manganese	6010C	**8950**	ug/L	1.1	0.2	1	04/13/21 11:00	04/09/21	

Printed 4/14/2021 10:06:06 AM

Superset Reference:

Analytical Report

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2103532
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: KQ2105589-02

Basis: NA

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	6010C	ND U	ug/L	21	5	1	04/13/21 10:02	04/09/21	
Antimony	6010C	ND U	ug/L	21	7	1	04/13/21 10:02	04/09/21	
Arsenic	6010C	ND U	ug/L	21	5	1	04/13/21 10:02	04/09/21	
Barium	6010C	ND U	ug/L	4.2	0.9	1	04/13/21 10:02	04/09/21	
Beryllium	6010C	ND U	ug/L	1.1	0.3	1	04/13/21 10:02	04/09/21	
Boron	6010C	ND U	ug/L	21	3	1	04/13/21 10:02	04/09/21	
Cadmium	6010C	ND U	ug/L	1.1	0.4	1	04/13/21 10:02	04/09/21	
Calcium	6010C	ND U	ug/L	21	3	1	04/13/21 10:02	04/09/21	
Chromium	6010C	ND U	ug/L	8.4	2.1	1	04/13/21 10:02	04/09/21	
Cobalt	6010C	ND U	ug/L	2.1	0.7	1	04/13/21 10:02	04/09/21	
Iron	6010C	ND U	ug/L	21	8	1	04/13/21 10:02	04/09/21	
Lead	6010C	ND U	ug/L	11	3	1	04/13/21 10:02	04/09/21	
Lithium	6010C	ND U	ug/L	21	6	1	04/13/21 10:02	04/09/21	
Magnesium	6010C	ND U	ug/L	5.3	0.4	1	04/13/21 10:02	04/09/21	
Manganese	6010C	ND U	ug/L	1.1	0.2	1	04/13/21 10:02	04/09/21	
Molybdenum	6010C	ND U	ug/L	8.4	2.1	1	04/13/21 10:02	04/09/21	
Nickel	6010C	ND U	ug/L	4.2	0.9	1	04/13/21 10:02	04/09/21	
Potassium	6010C	ND U	ug/L	210	60	1	04/13/21 10:02	04/09/21	
Selenium	6010C	ND U	ug/L	21	7	1	04/13/21 10:02	04/09/21	
Silicon	6010C	**30 J**	ug/L	210	30	1	04/13/21 10:02	04/09/21	
Silver	6010C	ND U	ug/L	8.4	2.1	1	04/13/21 10:02	04/09/21	
Sodium	6010C	ND U	ug/L	210	30	1	04/13/21 10:02	04/09/21	
Thallium	6010C	**6 J**	ug/L	11	4	1	04/13/21 10:02	04/09/21	
Zinc	6010C	ND U	ug/L	4.2	0.5	1	04/13/21 10:02	04/09/21	

QA/QC Report

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2103532
Date Analyzed: 04/13/21

Lab Control Sample Summary
Total Metals

Units: ug/L
Basis: NA

Lab Control Sample
KQ2105589-01

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	6010C	4960	5000	99	80-120
Iron	6010C	2430	2500	97	80-120
Manganese	6010C	1220	1250	98	80-120

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2103532
Date Analyzed: 04/13/21

Lab Control Sample Summary
Total Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ2105589-01

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony	6010C	2050	2000	103	80-120
Arsenic	6010C	2480	2500	99	80-120
Barium	6010C	4850	5000	97	80-120
Beryllium	6010C	124	125	99	80-120
Boron	6010C	494	500	99	80-120
Cadmium	6010C	1230	1250	99	80-120
Calcium	6010C	12300	12500	98	80-120
Chromium	6010C	496	500	99	80-120
Cobalt	6010C	1210	1250	97	80-120
Lead	6010C	2430	2500	97	80-120
Lithium	6010C	9850	10000	98	80-120
Magnesium	6010C	12500	12500	100	80-120
Molybdenum	6010C	1010	1000	101	80-120
Nickel	6010C	1200	1250	96	80-120
Potassium	6010C	12700	12500	101	80-120
Selenium	6010C	2480	2500	99	80-120
Silver	6010C	598	625	96	80-120
Sodium	6010C	12500	12500	100	80-120
Thallium	6010C	2390	2500	96	80-120
Zinc	6010C	1210	1250	97	80-120

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2103532
Date Analyzed: 04/13/21

Lab Control Sample Summary
Total Metals

Units: ug/L
Basis: NA

Lab Control Sample
KQ2105589-06

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Silicon	6010C	10000	10000	100	80-120

June 09, 2021 Service Request No:K2105581

Masa Kanematsu
Anchor QEA, LLC
6720 SW Macadam Avenue
Suite 125
Portland, OR 97219

Laboratory Results for: CCR-GSD

Dear Masa,

Enclosed are the results of the sample(s) submitted to our laboratory April 28, 2021
For your reference, these analyses have been assigned our service request number **K2105581.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris
Project Manager

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ALS Group USA, Corp.
dba ALS Environmental

Narrative Documents

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1317 South 13th Ave, Kelso, WA 98626 | 1-360-577-7222 | www.alsglobal.com

ALS Environmental

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD	**Date Received:**	04/28/2021
Sample Matrix:	Water		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier II level requested by the client.

Sample Receipt:

Forty eight water samples were received for analysis at ALS Environmental on 04/28/2021. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

Metals:

Method 200.8, 06/08/2021:The laboratory does not maintain a Method Detection Limit (MDL) study for Lithium by ICPMS. Lithium is a non-standard target analyte for this methodology at the Kelso lab. Results are reported to the Method Reporting Limit (MRL) for this analyte.

Approved by Noel D. Doe Date 06/09/2021

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-INF-1	Lab ID: K2105581-001					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	177		0.2	1.3	ug/L	200.8
Boron, Dissolved	444		1.3	5.0	ug/L	200.8
Iron, Dissolved	5010		0.8	5.0	ug/L	200.8
Lithium, Dissolved	29.6		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8720		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-1-1	Lab ID: K2105581-002					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.3	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	351		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.0	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	0.28		0.25	0.25	ug/L	200.8
Manganese, Dissolved	3050		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-2-1	Lab ID: K2105581-003					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Boron, Dissolved	214		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.8	J	0.8	5.0	ug/L	200.8
Manganese, Dissolved	2400		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-3-1	Lab ID: K2105581-004					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Boron, Dissolved	147		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.9	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	0.72		0.25	0.25	ug/L	200.8
Manganese, Dissolved	924		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-4-1	Lab ID: K2105581-005					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.2	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	63.5		1.3	5.0	ug/L	200.8
Iron, Dissolved	5.2		0.8	5.0	ug/L	200.8
Lithium, Dissolved	2.26		0.25	0.25	ug/L	200.8
Manganese, Dissolved	74.6		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-5-1	Lab ID: K2105581-006					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.0	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	66.8		1.3	5.0	ug/L	200.8
Iron, Dissolved	2.1	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	7.56		0.25	0.25	ug/L	200.8
Manganese, Dissolved	95.7		0.10	0.50	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-INF-3			Lab ID: K2105581-007			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	164		0.2	1.3	ug/L	200.8
Boron, Dissolved	444		1.3	5.0	ug/L	200.8
Iron, Dissolved	4710		0.8	5.0	ug/L	200.8
Lithium, Dissolved	28.8		0.25	0.25	ug/L	200.8
Manganese, Dissolved	9120		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-1-3			Lab ID: K2105581-008			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.7		0.2	1.3	ug/L	200.8
Boron, Dissolved	436		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.2	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	4.26		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7300		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-2-3			Lab ID: K2105581-009			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	13.1		0.2	1.3	ug/L	200.8
Boron, Dissolved	433		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.9	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	7.25		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7850		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-3-3			Lab ID: K2105581-010			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	24.9		0.2	1.3	ug/L	200.8
Boron, Dissolved	452		1.3	5.0	ug/L	200.8
Iron, Dissolved	38.9		0.8	5.0	ug/L	200.8
Lithium, Dissolved	24.1		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8100		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-4-3			Lab ID: K2105581-011			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	37.6		0.2	1.3	ug/L	200.8
Boron, Dissolved	448		1.3	5.0	ug/L	200.8
Iron, Dissolved	37.9		0.8	5.0	ug/L	200.8
Lithium, Dissolved	27.2		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8020		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-5-3			Lab ID: K2105581-012			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	3.1		0.2	1.3	ug/L	200.8
Boron, Dissolved	428		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.9	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	26.7		0.25	0.25	ug/L	200.8

ALS Environmental

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-5-3		Lab ID: K2105581-012				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Manganese, Dissolved	1220		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-INF-5		Lab ID: K2105581-013				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	149		0.2	1.3	ug/L	200.8
Boron, Dissolved	462		1.3	5.0	ug/L	200.8
Iron, Dissolved	4160		0.8	5.0	ug/L	200.8
Lithium, Dissolved	28.5		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8620		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-1-5		Lab ID: K2105581-014				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.5		0.2	1.3	ug/L	200.8
Boron, Dissolved	451		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.9	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	4.01		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7220		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-2-5		Lab ID: K2105581-015				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	9.5		0.2	1.3	ug/L	200.8
Boron, Dissolved	437		1.3	5.0	ug/L	200.8
Lithium, Dissolved	4.46		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7620		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-3-5		Lab ID: K2105581-016				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	22.0		0.2	1.3	ug/L	200.8
Boron, Dissolved	466		1.3	5.0	ug/L	200.8
Iron, Dissolved	13.3		0.8	5.0	ug/L	200.8
Lithium, Dissolved	25.2		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8280		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-4-5		Lab ID: K2105581-017				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	29.8		0.2	1.3	ug/L	200.8
Boron, Dissolved	440		1.3	5.0	ug/L	200.8
Iron, Dissolved	12.1		0.8	5.0	ug/L	200.8
Lithium, Dissolved	27.5		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8280		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-5-5		Lab ID: K2105581-018				
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	3.5		0.2	1.3	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-5-5	Lab ID: K2105581-018					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Boron, Dissolved	432		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.8	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	27.2		0.25	0.25	ug/L	200.8
Manganese, Dissolved	2210		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-INF-7	Lab ID: K2105581-019					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	92.6		0.2	1.3	ug/L	200.8
Boron, Dissolved	460		1.3	5.0	ug/L	200.8
Iron, Dissolved	2510		0.8	5.0	ug/L	200.8
Lithium, Dissolved	28.1		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8850		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-1-7	Lab ID: K2105581-020					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.6		0.2	1.3	ug/L	200.8
Boron, Dissolved	438		1.3	5.0	ug/L	200.8
Lithium, Dissolved	7.24		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7320		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-2-7	Lab ID: K2105581-021					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	9.2		0.2	1.3	ug/L	200.8
Boron, Dissolved	431		1.3	5.0	ug/L	200.8
Lithium, Dissolved	7.11		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8090		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-3-7	Lab ID: K2105581-022					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	13.0		0.2	1.3	ug/L	200.8
Boron, Dissolved	448		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.8	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	20.0		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7840		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-4-7	Lab ID: K2105581-023					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	22.3		0.2	1.3	ug/L	200.8
Boron, Dissolved	451		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.9	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	26.9		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8740		0.10	0.50	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-5-7			Lab ID: K2105581-024			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.5		0.2	1.3	ug/L	200.8
Boron, Dissolved	450		1.3	5.0	ug/L	200.8
Lithium, Dissolved	27.5		0.25	0.25	ug/L	200.8
Manganese, Dissolved	2780		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-INF-9			Lab ID: K2105581-025			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	62.0		0.2	1.3	ug/L	200.8
Boron, Dissolved	453		1.3	5.0	ug/L	200.8
Iron, Dissolved	1280		0.8	5.0	ug/L	200.8
Lithium, Dissolved	27.6		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8900		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-1-9			Lab ID: K2105581-026			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.7		0.2	1.3	ug/L	200.8
Boron, Dissolved	474		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.6	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	10.5		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7930		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-2-9			Lab ID: K2105581-027			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	12.4		0.2	1.3	ug/L	200.8
Boron, Dissolved	458		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.4	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	14.3		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8180		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-3-9			Lab ID: K2105581-028			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	10.5		0.2	1.3	ug/L	200.8
Boron, Dissolved	448		1.3	5.0	ug/L	200.8
Lithium, Dissolved	19.8		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8080		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-4-9			Lab ID: K2105581-029			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	21.7		0.2	1.3	ug/L	200.8
Boron, Dissolved	452		1.3	5.0	ug/L	200.8
Lithium, Dissolved	26.1		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8650		0.10	0.50	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-5-9 — **Lab ID: K2105581-030**

Analyte	Results	Flag	MDL	MRL	Units	Method
Arsenic, Dissolved	7.6		0.2	1.3	ug/L	200.8
Boron, Dissolved	453		1.3	5.0	ug/L	200.8
Iron, Dissolved	5.4		0.8	5.0	ug/L	200.8
Lithium, Dissolved	27.4		0.25	0.25	ug/L	200.8
Manganese, Dissolved	5920		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-INF-13 — **Lab ID: K2105581-031**

Analyte	Results	Flag	MDL	MRL	Units	Method
Arsenic, Dissolved	9.3		0.2	1.3	ug/L	200.8
Boron, Dissolved	448		1.3	5.0	ug/L	200.8
Iron, Dissolved	37.8		0.8	5.0	ug/L	200.8
Lithium, Dissolved	26.4		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8720		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-1-13 — **Lab ID: K2105581-032**

Analyte	Results	Flag	MDL	MRL	Units	Method
Arsenic, Dissolved	0.8	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	446		1.3	5.0	ug/L	200.8
Lithium, Dissolved	8.56		0.25	0.25	ug/L	200.8
Manganese, Dissolved	6760		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-2-13 — **Lab ID: K2105581-033**

Analyte	Results	Flag	MDL	MRL	Units	Method
Arsenic, Dissolved	1.8		0.2	1.3	ug/L	200.8
Boron, Dissolved	441		1.3	5.0	ug/L	200.8
Lithium, Dissolved	13.3		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7030		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-3-13 — **Lab ID: K2105581-034**

Analyte	Results	Flag	MDL	MRL	Units	Method
Arsenic, Dissolved	2.1		0.2	1.3	ug/L	200.8
Boron, Dissolved	441		1.3	5.0	ug/L	200.8
Lithium, Dissolved	18.8		0.25	0.25	ug/L	200.8
Manganese, Dissolved	7330		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-4-13 — **Lab ID: K2105581-035**

Analyte	Results	Flag	MDL	MRL	Units	Method
Arsenic, Dissolved	7.8		0.2	1.3	ug/L	200.8
Boron, Dissolved	448		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.8	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	26.7		0.25	0.25	ug/L	200.8
Manganese, Dissolved	8480		0.10	0.50	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-5-13	Lab ID: K2105581-036					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.0	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	426		1.3	5.0	ug/L	200.8
Iron, Dissolved	0.9	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	25.3		0.25	0.25	ug/L	200.8
Manganese, Dissolved	6940		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-INF-1	Lab ID: K2105581-037					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.7	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	6.5		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.8	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	1.32		0.25	0.25	ug/L	200.8
Manganese, Dissolved	10.4		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-1-1	Lab ID: K2105581-038					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Boron, Dissolved	55.4		1.3	5.0	ug/L	200.8
Iron, Dissolved	2.6	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	2.21		0.25	0.25	ug/L	200.8
Manganese, Dissolved	2030		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-2-1	Lab ID: K2105581-039					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.5	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	36.6		1.3	5.0	ug/L	200.8
Lithium, Dissolved	4.28		0.25	0.25	ug/L	200.8
Manganese, Dissolved	2280		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-3-1	Lab ID: K2105581-040					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.1	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	14.1		1.3	5.0	ug/L	200.8
Lithium, Dissolved	4.08		0.25	0.25	ug/L	200.8
Manganese, Dissolved	1820		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-4-1	Lab ID: K2105581-041					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	4.9		0.2	1.3	ug/L	200.8
Boron, Dissolved	14.3		1.3	5.0	ug/L	200.8
Iron, Dissolved	1.1	J	0.8	5.0	ug/L	200.8
Lithium, Dissolved	2.24		0.25	0.25	ug/L	200.8
Manganese, Dissolved	398		0.10	0.50	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-DS-5-1			Lab ID: K2105581-042			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.6	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	26.4		1.3	5.0	ug/L	200.8
Lithium, Dissolved	6.12		0.25	0.25	ug/L	200.8
Manganese, Dissolved	1980		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-INF-2			Lab ID: K2105581-043			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.9	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	5.9		1.3	5.0	ug/L	200.8
Lithium, Dissolved	1.35		0.25	0.25	ug/L	200.8
Manganese, Dissolved	10.9		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-1-2			Lab ID: K2105581-044			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Boron, Dissolved	38.9		1.3	5.0	ug/L	200.8
Lithium, Dissolved	2.10		0.25	0.25	ug/L	200.8
Manganese, Dissolved	1790		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-2-2			Lab ID: K2105581-045			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.4	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	16.6		1.3	5.0	ug/L	200.8
Lithium, Dissolved	3.39		0.25	0.25	ug/L	200.8
Manganese, Dissolved	2150		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-3-2			Lab ID: K2105581-046			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	1.2	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	8.0		1.3	5.0	ug/L	200.8
Lithium, Dissolved	3.22		0.25	0.25	ug/L	200.8
Manganese, Dissolved	1270		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-4-2			Lab ID: K2105581-047			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	5.1		0.2	1.3	ug/L	200.8
Boron, Dissolved	9.8		1.3	5.0	ug/L	200.8
Lithium, Dissolved	1.95		0.25	0.25	ug/L	200.8
Manganese, Dissolved	250		0.10	0.50	ug/L	200.8

CLIENT ID: GSD-COL-DS-5-2			Lab ID: K2105581-048			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Arsenic, Dissolved	0.4	J	0.2	1.3	ug/L	200.8
Boron, Dissolved	16.3		1.3	5.0	ug/L	200.8
Lithium, Dissolved	5.13		0.25	0.25	ug/L	200.8

SAMPLE DETECTION SUMMARY

CLIENT ID: GSD-COL-DS-5-2	Lab ID: K2105581-048					
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Manganese, Dissolved	1820		0.10	0.50	ug/L	200.8

Sample Receipt Information

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
K2105581-001	GSD-COL-INF-1	4/7/2021	1300
K2105581-002	GSD-COL-1-1	4/7/2021	1300
K2105581-003	GSD-COL-2-1	4/7/2021	1300
K2105581-004	GSD-COL-3-1	4/7/2021	1300
K2105581-005	GSD-COL-4-1	4/7/2021	1300
K2105581-006	GSD-COL-5-1	4/7/2021	1300
K2105581-007	GSD-COL-INF-3	4/8/2021	0825
K2105581-008	GSD-COL-1-3	4/8/2021	0825
K2105581-009	GSD-COL-2-3	4/8/2021	0825
K2105581-010	GSD-COL-3-3	4/8/2021	0825
K2105581-011	GSD-COL-4-3	4/8/2021	0825
K2105581-012	GSD-COL-5-3	4/8/2021	0825
K2105581-013	GSD-COL-INF-5	4/8/2021	1800
K2105581-014	GSD-COL-1-5	4/8/2021	1800
K2105581-015	GSD-COL-2-5	4/8/2021	1800
K2105581-016	GSD-COL-3-5	4/8/2021	1800
K2105581-017	GSD-COL-4-5	4/8/2021	1800
K2105581-018	GSD-COL-5-5	4/8/2021	1800
K2105581-019	GSD-COL-INF-7	4/10/2021	1415
K2105581-020	GSD-COL-1-7	4/10/2021	1415
K2105581-021	GSD-COL-2-7	4/10/2021	1415
K2105581-022	GSD-COL-3-7	4/10/2021	1415
K2105581-023	GSD-COL-4-7	4/10/2021	1415
K2105581-024	GSD-COL-5-7	4/10/2021	1415
K2105581-025	GSD-COL-INF-9	4/12/2021	1110
K2105581-026	GSD-COL-1-9	4/12/2021	1110
K2105581-027	GSD-COL-2-9	4/12/2021	1110
K2105581-028	GSD-COL-3-9	4/12/2021	1110
K2105581-029	GSD-COL-4-9	4/12/2021	1110
K2105581-030	GSD-COL-5-9	4/12/2021	1110
K2105581-031	GSD-COL-INF-13	4/18/2021	1115
K2105581-032	GSD-COL-1-13	4/18/2021	1115
K2105581-033	GSD-COL-2-13	4/18/2021	1115
K2105581-034	GSD-COL-3-13	4/18/2021	1115
K2105581-035	GSD-COL-4-13	4/18/2021	1115
K2105581-036	GSD-COL-5-13	4/18/2021	1115
K2105581-037	GSD-COL-DS-INF-1	4/24/2021	1300
K2105581-038	GSD-COL-DS-1-1	4/24/2021	1300
K2105581-039	GSD-COL-DS-2-1	4/24/2021	1300
K2105581-040	GSD-COL-DS-3-1	4/24/2021	1300
K2105581-041	GSD-COL-DS-4-1	4/24/2021	1300
K2105581-042	GSD-COL-DS-5-1	4/24/2021	1300

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
K2105581-043	GSD-COL-DS-INF-2	4/25/2021	1315
K2105581-044	GSD-COL-DS-1-2	4/25/2021	1315
K2105581-045	GSD-COL-DS-2-2	4/25/2021	1315
K2105581-046	GSD-COL-DS-3-2	4/25/2021	1315
K2105581-047	GSD-COL-DS-4-2	4/25/2021	1315
K2105581-048	GSD-COL-DS-5-2	4/25/2021	1315

K2105581
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Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019

Date:	4/27/2021
Project Name:	CCR-GSD
Project Number:	201114-03.02 Task 02
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (Masa Kanematsu)
Shipment Method:	Fedex Overnight

ANCHOR QEA

Jessica Goin
6720 SW Macadam Ave
Suite 125
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Arsenic, Lithium, Boron (dissolved)	Iron, Manganase (dissolved)	Comments/Preservation
1	GSD-COL-INF-1	4/7/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
2	GSD-COL-1-1	4/7/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
3	GSD-COL-2-1	4/7/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
4	GSD-COL-3-1	4/7/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
5	GSD-COL-4-1	4/7/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
6	GSD-COL-5-1	4/7/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
7	GSD-COL-INF-3	4/8/2021	8:25	Water	1	X	X	HNO_3 preserved, filtered
8	GSD-COL-1-3	4/8/2021	8:25	Water	1	X	X	HNO_3 preserved, filtered
9	GSD-COL-2-3	4/8/2021	8:25	Water	1	X	X	HNO_3 preserved, filtered
10	GSD-COL-3-3	4/8/2021	8:25	Water	1	X	X	HNO_3 preserved, filtered
11	GSD-COL-4-3	4/8/2021	8:25	Water	1	X	X	HNO_3 preserved, filtered
12	GSD-COL-5-3	4/8/2021	8:25	Water	1	X	X	HNO_3 preserved, filtered
13								
14								
15								

Notes: **Please analyze all analytes with** Standard TAT **on this page. Estimated concentrations As: < 1 mg/L, Li: < 100 ug/L, B: < 1 mg/L, Fe: <5 mg/L, Mn: < 10 mg/L**

Relinquished by:	Company:
Masa Kanematsu	Anchor QEA
Signature/Print Name:	Date/Time:
[signature]	4/27/2020 16:30

Received by:	Company:
[signature]	ALS
Signature/Print Name:	Date/Time:
[illegible]	4/28/21 1000

Relinquished by:	Company:
Signature/Print Name:	Date/Time:

Received by:	Company:
Signature/Print Name:	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

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Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	4/27/2021
Project Name:	CCR-GSD
Project Number:	201114-03.02 Task 02
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (Masa Kanematsu)
Shipment Method:	Fedex Overnight

ANCHOR QEA
Jessica Goin
6720 SW Macadam Ave
Suite 125
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Arsenic, Lithium, Boron (dissolved)	Iron, Manganase (dissolved)	Comments/Preservation
1	GSD-COL-INF-5	4/8/2021	18:00	Water	1	X	X	HNO_3 preserved, filtered
2	GSD-COL-1-5	4/8/2021	18:00	Water	1	X	X	HNO_3 preserved, filtered
3	GSD-COL-2-5	4/8/2021	18:00	Water	1	X	X	HNO_3 preserved, filtered
4	GSD-COL-3-5	4/8/2021	18:00	Water	1	X	X	HNO_3 preserved, filtered
5	GSD-COL-4-5	4/8/2021	18:00	Water	1	X	X	HNO_3 preserved, filtered
6	GSD-COL-5-5	4/8/2021	18:00	Water	1	X	X	HNO_3 preserved, filtered
7	GSD-COL-INF-7	4/10/2021	14:15	Water	1	X	X	HNO_3 preserved, filtered
8	GSD-COL-1-7	4/10/2021	14:15	Water	1	X	X	HNO_3 preserved, filtered
9	GSD-COL-2-7	4/10/2021	14:15	Water	1	X	X	HNO_3 preserved, filtered
10	GSD-COL-3-7	4/10/2021	14:15	Water	1	X	X	HNO_3 preserved, filtered
11	GSD-COL-4-7	4/10/2021	14:15	Water	1	X	X	HNO_3 preserved, filtered
12	GSD-COL-5-7	4/10/2021	14:15	Water	1	X	X	HNO_3 preserved, filtered
13								
14								
15								

Notes: **Please analyze all analytes with** Standard TAT **on this page. Estimated concentrations As: < 1 mg/L, Li: < 100 ug/L, B: < 1 mg/L, Fe: <5 mg/L, Mn: < 10 mg/L**

Relinquished by:	Company:	Received by:	Company:
Masa Kanematsu	Anchor QEA		
Signature/Print Name:	Date/Time:	Signature/Print Name:	Date/Time:
	4/27/2020 16:30		4/28/21 1000

Relinquished by:	Company:	Received by:	Company:
Signature/Print Name:	Date/Time:	Signature/Print Name:	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

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Chain of Custody Record & Laboratory Analysis Request

ANCHOR QEA

Jessica Goin
6720 SW Macadam Ave
Suite 125
Portland OR 97219

Laboratory Number:	503-972-5019
Date:	4/27/2021
Project Name:	CCR-GSD
Project Number:	201114-03.02 Task 02
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (Masa Kanematsu)
Shipment Method:	Fedex Overnight

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Arsenic, Lithium, Boron (dissolved)	Iron, Manganase (dissolved)	Comments/Preservation
1	GSD-COL-INF-9	4/12/2021	11:10	Water	1	X	X	HNO_3 preserved, filtered
2	GSD-COL-1-9	4/12/2021	11:10	Water	1	X	X	HNO_3 preserved, filtered
3	GSD-COL-2-9	4/12/2021	11:10	Water	1	X	X	HNO_3 preserved, filtered
4	GSD-COL-3-9	4/12/2021	11:10	Water	1	X	X	HNO_3 preserved, filtered
5	GSD-COL-4-9	4/12/2021	11:10	Water	1	X	X	HNO_3 preserved, filtered
6	GSD-COL-5-9	4/12/2021	11:10	Water	1	X	X	HNO_3 preserved, filtered
7	GSD-COL-INF-13	4/18/2021	11:15	Water	1	X	X	HNO_3 preserved, filtered
8	GSD-COL-1-13	4/18/2021	11:15	Water	1	X	X	HNO_3 preserved, filtered
9	GSD-COL-2-13	4/18/2021	11:15	Water	1	X	X	HNO_3 preserved, filtered
10	GSD-COL-3-13	4/18/2021	11:15	Water	1	X	X	HNO_3 preserved, filtered
11	GSD-COL-4-13	4/18/2021	11:15	Water	1	X	X	HNO_3 preserved, filtered
12	GSD-COL-5-13	4/18/2021	11:15	Water	1	X	X	HNO_3 preserved, filtered
13								
14								
15								

Notes: **Please analyze all analytes with** Standard TAT **on this page. Estimated concentrations As: < 1 mg/L, Li: < 100 ug/L, B: < 1 mg/L, Fe: <5 mg/L, Mn: < 10 mg/L**

Relinquished by:	Company:	Received by:	Company:
Masa Kanematsu	Anchor QEA		
Signature/Print Name:	Date/Time:	Signature/Print Name:	Date/Time:
	4/27/2020 16:30	B...	4/28/21 1000
Relinquished by:	Company:	Received by:	Company:
Signature/Print Name:	Date/Time:	Signature/Print Name:	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

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K2105581
~~K2104559~~

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019

Date:	4/27/2021
Project Name:	CCR-GSD
Project Number:	201114-03.02 Task 02
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (Masa Kanematsu)
Shipment Method:	Fedex Overnight

ANCHOR QEA

Jessica Goin
6720 SW Macadam Ave
Suite 125
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Arsenic, Lithium, Boron (dissolved)	Iron, Manganase (dissolved)	Comments/Preservation
1	GSD-COL-DS-INF-1	4/24/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
2	GSD-COL-DS-1-1	4/24/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
3	GSD-COL-DS-2-1	4/24/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
4	GSD-COL-DS-3-1	4/24/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
5	GSD-COL-DS-4-1	4/24/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
6	GSD-COL-DS-5-1	4/24/2021	13:00	Water	1	X	X	HNO_3 preserved, filtered
7	GSD-COL-DS-INF-2	4/25/2021	13:15	Water	1	X	X	HNO_3 preserved, filtered
8	GSD-COL-DS-1-2	4/25/2021	13:15	Water	1	X	X	HNO_3 preserved, filtered
9	GSD-COL-DS-2-2	4/25/2021	13:15	Water	1	X	X	HNO_3 preserved, filtered
10	GSD-COL-DS-3-2	4/25/2021	13:15	Water	1	X	X	HNO_3 preserved, filtered
11	GSD-COL-DS-4-2	4/25/2021	13:15	Water	1	X	X	HNO_3 preserved, filtered
12	GSD-COL-DS-5-2	4/25/2021	13:15	Water	1	X	X	HNO_3 preserved, filtered
13								
14								
15								

Notes: **Please analyze all analytes with** Standard TAT **on this page. Estimated concentrations As: < 1 mg/L, Li: < 100 ug/L, B: < 1 mg/L, Fe: <5 mg/L, Mn: < 10 mg/L**

Relinquished by:	Company:
Masa Kanematsu	Anchor QEA
Signature/Print Name:	Date/Time:
[signature]	4/27/2020 16:30

Received by:	Company:
	ALS
Signature/Print Name:	Date/Time:
[signature] Kleman	4/28/21 1100

Relinquished by:	Company:
Signature/Print Name:	Date/Time:

Received by:	Company:
Signature/Print Name:	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

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K2105581 PM Mark

Cooler Receipt and Preservation Form

Client Anchor QEA Service Request K21 04559

Received: 4/28/21 Opened: 4/28/21 By: BK Unloaded: 4/28/21 By: BK

1. Samples were received via? *USPS* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* ________ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? ________
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N
4. Was a Temperature Blank present in cooler? NA Y N If yes, notate the temperature in the appropriate column below:
   If no, take the temperature of a representative sample bottle contained within the cooler; notate in the column "Sample Temp":
5. Were samples received within the method specified temperature ranges? NA Y N
   If no, were they received on ice and same day as collected? If not, notate the cooler # below and notify the PM. NA Y N

If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*

Temp Blank	Sample Temp	IR Gun	Cooler #/COC ID NA	Out of temp indicate with "X"	PM Notified If out of temp	Tracking Number NA	Filed
16.3	–	IR01		–	–	773567845348	
15.8	–			–	–	773567832268	

6. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* ________
7. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
8. Were samples received in good condition (unbroken) NA Y N
9. Were all sample labels complete (ie, analysis, preservation, etc.)? NA Y N
10. Did all sample labels and tags agree with custody papers? NA Y N
11. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
12. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
13. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
14. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, Resolutions: ________

Miscellaneous Forms

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360) 577-7222 Fax (360) 425-9096
www.alsglobal.com

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Analyst Summary report

Client: Anchor QEA, LLC **Service Request:** K2105581
Project: CCR-GSD/201114-03.02 Task 02

Sample Name: GSD-COL-INF-1 **Date Collected:** 04/7/21
Lab Code: K2105581-001 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-1-1 **Date Collected:** 04/7/21
Lab Code: K2105581-002 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-2-1 **Date Collected:** 04/7/21
Lab Code: K2105581-003 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-3-1 **Date Collected:** 04/7/21
Lab Code: K2105581-004 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-4-1 **Date Collected:** 04/7/21
Lab Code: K2105581-005 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC
Service Request: K2105581
Project: CCR-GSD/201114-03.02 Task 02

Sample Name: GSD-COL-5-1
Date Collected: 04/7/21
Lab Code: K2105581-006
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-INF-3
Date Collected: 04/8/21
Lab Code: K2105581-007
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-1-3
Date Collected: 04/8/21
Lab Code: K2105581-008
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-2-3
Date Collected: 04/8/21
Lab Code: K2105581-009
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-3-3
Date Collected: 04/8/21
Lab Code: K2105581-010
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Service Request: K2105581

Sample Name: GSD-COL-4-3
Lab Code: K2105581-011
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-5-3
Lab Code: K2105581-012
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-INF-5
Lab Code: K2105581-013
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-1-5
Lab Code: K2105581-014
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-2-5
Lab Code: K2105581-015
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Service Request: K2105581

Sample Name: GSD-COL-3-5
Lab Code: K2105581-016
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-4-5
Lab Code: K2105581-017
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-5-5
Lab Code: K2105581-018
Sample Matrix: Water
Date Collected: 04/8/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-INF-7
Lab Code: K2105581-019
Sample Matrix: Water
Date Collected: 04/10/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-1-7
Lab Code: K2105581-020
Sample Matrix: Water
Date Collected: 04/10/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Service Request: K2105581

Sample Name: GSD-COL-2-7
Lab Code: K2105581-021
Sample Matrix: Water
Date Collected: 04/10/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-3-7
Lab Code: K2105581-022
Sample Matrix: Water
Date Collected: 04/10/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-4-7
Lab Code: K2105581-023
Sample Matrix: Water
Date Collected: 04/10/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-5-7
Lab Code: K2105581-024
Sample Matrix: Water
Date Collected: 04/10/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-INF-9
Lab Code: K2105581-025
Sample Matrix: Water
Date Collected: 04/12/21
Date Received: 04/28/21

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC **Service Request:** K2105581
Project: CCR-GSD/201114-03.02 Task 02

Sample Name: GSD-COL-1-9 **Date Collected:** 04/12/21
Lab Code: K2105581-026 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-2-9 **Date Collected:** 04/12/21
Lab Code: K2105581-027 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-3-9 **Date Collected:** 04/12/21
Lab Code: K2105581-028 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-4-9 **Date Collected:** 04/12/21
Lab Code: K2105581-029 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-5-9 **Date Collected:** 04/12/21
Lab Code: K2105581-030 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC
Service Request: K2105581
Project: CCR-GSD/201114-03.02 Task 02

Sample Name: GSD-COL-INF-13
Date Collected: 04/18/21
Lab Code: K2105581-031
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-1-13
Date Collected: 04/18/21
Lab Code: K2105581-032
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-2-13
Date Collected: 04/18/21
Lab Code: K2105581-033
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-3-13
Date Collected: 04/18/21
Lab Code: K2105581-034
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-4-13
Date Collected: 04/18/21
Lab Code: K2105581-035
Date Received: 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC **Service Request:** K2105581
Project: CCR-GSD/201114-03.02 Task 02

Sample Name: GSD-COL-5-13 **Date Collected:** 04/18/21
Lab Code: K2105581-036 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-INF-1 **Date Collected:** 04/24/21
Lab Code: K2105581-037 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-1-1 **Date Collected:** 04/24/21
Lab Code: K2105581-038 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-2-1 **Date Collected:** 04/24/21
Lab Code: K2105581-039 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-3-1 **Date Collected:** 04/24/21
Lab Code: K2105581-040 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Client: Anchor QEA, LLC **Service Request:** K2105581
Project: CCR-GSD/201114-03.02 Task 02

Sample Name: GSD-COL-DS-4-1 **Date Collected:** 04/24/21
Lab Code: K2105581-041 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-5-1 **Date Collected:** 04/24/21
Lab Code: K2105581-042 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-INF-2 **Date Collected:** 04/25/21
Lab Code: K2105581-043 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-1-2 **Date Collected:** 04/25/21
Lab Code: K2105581-044 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Sample Name: GSD-COL-DS-2-2 **Date Collected:** 04/25/21
Lab Code: K2105581-045 **Date Received:** 04/28/21
Sample Matrix: Water

Analysis Method	**Extracted/Digested By**	**Analyzed By**
200.8	ABOYER	RMOORE

Analyst Summary report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		

Sample Name:	GSD-COL-DS-3-2	**Date Collected:**	04/25/21
Lab Code:	K2105581-046	**Date Received:**	04/28/21
Sample Matrix:	Water		

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name:	GSD-COL-DS-4-2	**Date Collected:**	04/25/21
Lab Code:	K2105581-047	**Date Received:**	04/28/21
Sample Matrix:	Water		

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Name:	GSD-COL-DS-5-2	**Date Collected:**	04/25/21
Lab Code:	K2105581-048	**Date Received:**	04/28/21
Sample Matrix:	Water		

Analysis Method	Extracted/Digested By	Analyzed By
200.8	ABOYER	RMOORE

Sample Results

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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Metals

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-INF-1	**Basis:**	NA
Lab Code:	K2105581-001		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**177**	ug/L	1.3	0.2	1	06/08/21 13:20	05/26/21	
Boron	200.8	**444**	ug/L	5.0	1.3	1	06/08/21 13:20	05/26/21	
Iron	200.8	**5010**	ug/L	5.0	0.8	1	06/08/21 13:20	05/26/21	
Lithium	200.8	**29.6**	ug/L	0.25	0.25	1	06/08/21 13:20	05/26/21	
Manganese	200.8	**8720**	ug/L	0.50	0.10	1	06/08/21 13:20	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-1-1	**Basis:**	NA
Lab Code:	K2105581-002		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.3 J**	ug/L	1.3	0.2	1	06/08/21 13:22	05/26/21	
Boron	200.8	**351**	ug/L	5.0	1.3	1	06/08/21 13:22	05/26/21	
Iron	200.8	**1.0 J**	ug/L	5.0	0.8	1	06/08/21 13:22	05/26/21	
Lithium	200.8	**0.28**	ug/L	0.25	0.25	1	06/08/21 13:22	05/26/21	
Manganese	200.8	**3050**	ug/L	0.50	0.10	1	06/08/21 13:22	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/07/21 13:00
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-2-1		**Basis:**	NA
Lab Code:	K2105581-003			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND U	ug/L	1.3	0.2	1	06/08/21 13:26	05/26/21	
Boron	200.8	**214**	ug/L	5.0	1.3	1	06/08/21 13:26	05/26/21	
Iron	200.8	**0.8 J**	ug/L	5.0	0.8	1	06/08/21 13:26	05/26/21	
Lithium	200.8	ND U	ug/L	0.25	0.25	1	06/08/21 13:26	05/26/21	
Manganese	200.8	**2400**	ug/L	0.50	0.10	1	06/08/21 13:26	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-3-1	**Basis:**	NA
Lab Code:	K2105581-004		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND U	ug/L	1.3	0.2	1	06/08/21 13:31	05/26/21	
Boron	200.8	**147**	ug/L	5.0	1.3	1	06/08/21 13:31	05/26/21	
Iron	200.8	**0.9 J**	ug/L	5.0	0.8	1	06/08/21 13:31	05/26/21	
Lithium	200.8	**0.72**	ug/L	0.25	0.25	1	06/08/21 13:31	05/26/21	
Manganese	200.8	**924**	ug/L	0.50	0.10	1	06/08/21 13:31	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-4-1	**Basis:**	NA
Lab Code:	K2105581-005		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.2 J**	ug/L	1.3	0.2	1	06/08/21 13:33	05/26/21	
Boron	200.8	**63.5**	ug/L	5.0	1.3	1	06/08/21 13:33	05/26/21	
Iron	200.8	**5.2**	ug/L	5.0	0.8	1	06/08/21 13:33	05/26/21	
Lithium	200.8	**2.26**	ug/L	0.25	0.25	1	06/08/21 13:33	05/26/21	
Manganese	200.8	**74.6**	ug/L	0.50	0.10	1	06/08/21 13:33	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/07/21 13:00
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-5-1		**Basis:**	NA
Lab Code:	K2105581-006			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.0 J**	ug/L	1.3	0.2	1	06/08/21 13:35	05/26/21	
Boron	200.8	**66.8**	ug/L	5.0	1.3	1	06/08/21 13:35	05/26/21	
Iron	200.8	**2.1 J**	ug/L	5.0	0.8	1	06/08/21 13:35	05/26/21	
Lithium	200.8	**7.56**	ug/L	0.25	0.25	1	06/08/21 13:35	05/26/21	
Manganese	200.8	**95.7**	ug/L	0.50	0.10	1	06/08/21 13:35	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/08/21 08:25
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-INF-3		**Basis:**	NA
Lab Code:	K2105581-007			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**164**	ug/L	1.3	0.2	1	06/08/21 13:40	05/26/21	
Boron	200.8	**444**	ug/L	5.0	1.3	1	06/08/21 13:40	05/26/21	
Iron	200.8	**4710**	ug/L	5.0	0.8	1	06/08/21 13:40	05/26/21	
Lithium	200.8	**28.8**	ug/L	0.25	0.25	1	06/08/21 13:40	05/26/21	
Manganese	200.8	**9120**	ug/L	0.50	0.10	1	06/08/21 13:40	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/08/21 08:25
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-1-3	**Basis:**	NA
Lab Code:	K2105581-008		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.7**	ug/L	1.3	0.2	1	06/08/21 13:41	05/26/21	
Boron	200.8	**436**	ug/L	5.0	1.3	1	06/08/21 13:41	05/26/21	
Iron	200.8	**1.2 J**	ug/L	5.0	0.8	1	06/08/21 13:41	05/26/21	
Lithium	200.8	**4.26**	ug/L	0.25	0.25	1	06/08/21 13:41	05/26/21	
Manganese	200.8	**7300**	ug/L	0.50	0.10	1	06/08/21 13:41	05/26/21	

Analytical Report

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2105581
Date Collected: 04/08/21 08:25
Date Received: 04/28/21 10:00

Sample Name: GSD-COL-2-3
Lab Code: K2105581-009

Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**13.1**	ug/L	1.3	0.2	1	06/08/21 13:43	05/26/21	
Boron	200.8	**433**	ug/L	5.0	1.3	1	06/08/21 13:43	05/26/21	
Iron	200.8	**1.9 J**	ug/L	5.0	0.8	1	06/08/21 13:43	05/26/21	
Lithium	200.8	**7.25**	ug/L	0.25	0.25	1	06/08/21 13:43	05/26/21	
Manganese	200.8	**7850**	ug/L	0.50	0.10	1	06/08/21 13:43	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/08/21 08:25
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-3-3		**Basis:**	NA
Lab Code:	K2105581-010			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**24.9**	ug/L	1.3	0.2	1	06/08/21 13:44	05/26/21	
Boron	200.8	**452**	ug/L	5.0	1.3	1	06/08/21 13:44	05/26/21	
Iron	200.8	**38.9**	ug/L	5.0	0.8	1	06/08/21 13:44	05/26/21	
Lithium	200.8	**24.1**	ug/L	0.25	0.25	1	06/08/21 13:44	05/26/21	
Manganese	200.8	**8100**	ug/L	0.50	0.10	1	06/08/21 13:44	05/26/21	

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2105581
Date Collected: 04/08/21 08:25
Date Received: 04/28/21 10:00

Sample Name: GSD-COL-4-3
Lab Code: K2105581-011

Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**37.6**	ug/L	1.3	0.2	1	06/08/21 13:46	05/26/21	
Boron	200.8	**448**	ug/L	5.0	1.3	1	06/08/21 13:46	05/26/21	
Iron	200.8	**37.9**	ug/L	5.0	0.8	1	06/08/21 13:46	05/26/21	
Lithium	200.8	**27.2**	ug/L	0.25	0.25	1	06/08/21 13:46	05/26/21	
Manganese	200.8	**8020**	ug/L	0.50	0.10	1	06/08/21 13:46	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/08/21 08:25
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-5-3		**Basis:**	NA
Lab Code:	K2105581-012			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**3.1**	ug/L	1.3	0.2	1	06/08/21 13:48	05/26/21	
Boron	200.8	**428**	ug/L	5.0	1.3	1	06/08/21 13:48	05/26/21	
Iron	200.8	**0.9 J**	ug/L	5.0	0.8	1	06/08/21 13:48	05/26/21	
Lithium	200.8	**26.7**	ug/L	0.25	0.25	1	06/08/21 13:48	05/26/21	
Manganese	200.8	**1220**	ug/L	0.50	0.10	1	06/08/21 13:48	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/08/21 18:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-INF-5	**Basis:**	NA
Lab Code:	K2105581-013		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**149**	ug/L	1.3	0.2	1	06/08/21 13:49	05/26/21	
Boron	200.8	**462**	ug/L	5.0	1.3	1	06/08/21 13:49	05/26/21	
Iron	200.8	**4160**	ug/L	5.0	0.8	1	06/08/21 13:49	05/26/21	
Lithium	200.8	**28.5**	ug/L	0.25	0.25	1	06/08/21 13:49	05/26/21	
Manganese	200.8	**8620**	ug/L	0.50	0.10	1	06/08/21 13:49	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/08/21 18:00
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-1-5		**Basis:**	NA
Lab Code:	K2105581-014			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.5**	ug/L	1.3	0.2	1	06/08/21 13:51	05/26/21	
Boron	200.8	**451**	ug/L	5.0	1.3	1	06/08/21 13:51	05/26/21	
Iron	200.8	**0.9 J**	ug/L	5.0	0.8	1	06/08/21 13:51	05/26/21	
Lithium	200.8	**4.01**	ug/L	0.25	0.25	1	06/08/21 13:51	05/26/21	
Manganese	200.8	**7220**	ug/L	0.50	0.10	1	06/08/21 13:51	05/26/21	

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/08/21 18:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-2-5	**Basis:**	NA
Lab Code:	K2105581-015		

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**9.5**		ug/L	1.3	0.2	1	06/08/21 13:53	05/26/21	
Boron	200.8	**437**		ug/L	5.0	1.3	1	06/08/21 13:53	05/26/21	
Iron	200.8	ND	U	ug/L	5.0	0.8	1	06/08/21 13:53	05/26/21	
Lithium	200.8	**4.46**		ug/L	0.25	0.25	1	06/08/21 13:53	05/26/21	
Manganese	200.8	**7620**		ug/L	0.50	0.10	1	06/08/21 13:53	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/08/21 18:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-3-5	**Basis:**	NA
Lab Code:	K2105581-016		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**22.0**	ug/L	1.3	0.2	1	06/08/21 13:54	05/26/21	
Boron	200.8	**466**	ug/L	5.0	1.3	1	06/08/21 13:54	05/26/21	
Iron	200.8	**13.3**	ug/L	5.0	0.8	1	06/08/21 13:54	05/26/21	
Lithium	200.8	**25.2**	ug/L	0.25	0.25	1	06/08/21 13:54	05/26/21	
Manganese	200.8	**8280**	ug/L	0.50	0.10	1	06/08/21 13:54	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/08/21 18:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-4-5	**Basis:**	NA
Lab Code:	K2105581-017		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**29.8**	ug/L	1.3	0.2	1	06/08/21 14:15	05/26/21	
Boron	200.8	**440**	ug/L	5.0	1.3	1	06/08/21 14:15	05/26/21	
Iron	200.8	**12.1**	ug/L	5.0	0.8	1	06/08/21 14:15	05/26/21	
Lithium	200.8	**27.5**	ug/L	0.25	0.25	1	06/08/21 14:15	05/26/21	
Manganese	200.8	**8280**	ug/L	0.50	0.10	1	06/08/21 14:15	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/08/21 18:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-5-5	**Basis:**	NA
Lab Code:	K2105581-018		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**3.5**	ug/L	1.3	0.2	1	06/08/21 14:17	05/26/21	
Boron	200.8	**432**	ug/L	5.0	1.3	1	06/08/21 14:17	05/26/21	
Iron	200.8	**0.8 J**	ug/L	5.0	0.8	1	06/08/21 14:17	05/26/21	
Lithium	200.8	**27.2**	ug/L	0.25	0.25	1	06/08/21 14:17	05/26/21	
Manganese	200.8	**2210**	ug/L	0.50	0.10	1	06/08/21 14:17	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21 14:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-INF-7	**Basis:**	NA
Lab Code:	K2105581-019		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**92.6**	ug/L	1.3	0.2	1	06/08/21 14:18	05/26/21	
Boron	200.8	**460**	ug/L	5.0	1.3	1	06/08/21 14:18	05/26/21	
Iron	200.8	**2510**	ug/L	5.0	0.8	1	06/08/21 14:18	05/26/21	
Lithium	200.8	**28.1**	ug/L	0.25	0.25	1	06/08/21 14:18	05/26/21	
Manganese	200.8	**8850**	ug/L	0.50	0.10	1	06/08/21 14:18	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21 14:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-1-7	**Basis:**	NA
Lab Code:	K2105581-020		

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.6**		ug/L	1.3	0.2	1	06/08/21 14:20	05/26/21	
Boron	200.8	**438**		ug/L	5.0	1.3	1	06/08/21 14:20	05/26/21	
Iron	200.8	ND	U	ug/L	5.0	0.8	1	06/08/21 14:20	05/26/21	
Lithium	200.8	**7.24**		ug/L	0.25	0.25	1	06/08/21 14:20	05/26/21	
Manganese	200.8	**7320**		ug/L	0.50	0.10	1	06/08/21 14:20	05/26/21	

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21 14:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-2-7	**Basis:**	NA
Lab Code:	K2105581-021		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**9.2**	ug/L	1.3	0.2	1	06/08/21 14:57	05/26/21	
Boron	200.8	**431**	ug/L	5.0	1.3	1	06/08/21 14:57	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 14:57	05/26/21	
Lithium	200.8	**7.11**	ug/L	0.25	0.25	1	06/08/21 14:57	05/26/21	
Manganese	200.8	**8090**	ug/L	0.50	0.10	1	06/08/21 14:57	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21 14:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-3-7	**Basis:**	NA
Lab Code:	K2105581-022		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**13.0**	ug/L	1.3	0.2	1	06/08/21 14:58	05/26/21	
Boron	200.8	**448**	ug/L	5.0	1.3	1	06/08/21 14:58	05/26/21	
Iron	200.8	**0.8 J**	ug/L	5.0	0.8	1	06/08/21 14:58	05/26/21	
Lithium	200.8	**20.0**	ug/L	0.25	0.25	1	06/08/21 14:58	05/26/21	
Manganese	200.8	**7840**	ug/L	0.50	0.10	1	06/08/21 14:58	05/26/21	

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2105581
Date Collected: 04/10/21 14:15
Date Received: 04/28/21 10:00

Sample Name: GSD-COL-4-7
Lab Code: K2105581-023

Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**22.3**	ug/L	1.3	0.2	1	06/08/21 15:03	05/26/21	
Boron	200.8	**451**	ug/L	5.0	1.3	1	06/08/21 15:03	05/26/21	
Iron	200.8	**0.9 J**	ug/L	5.0	0.8	1	06/08/21 15:03	05/26/21	
Lithium	200.8	**26.9**	ug/L	0.25	0.25	1	06/08/21 15:03	05/26/21	
Manganese	200.8	**8740**	ug/L	0.50	0.10	1	06/08/21 15:03	05/26/21	

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21 14:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-5-7	**Basis:**	NA
Lab Code:	K2105581-024		

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.5**		ug/L	1.3	0.2	1	06/08/21 15:08	05/26/21	
Boron	200.8	**450**		ug/L	5.0	1.3	1	06/08/21 15:08	05/26/21	
Iron	200.8	ND	U	ug/L	5.0	0.8	1	06/08/21 15:08	05/26/21	
Lithium	200.8	**27.5**		ug/L	0.25	0.25	1	06/08/21 15:08	05/26/21	
Manganese	200.8	**2780**		ug/L	0.50	0.10	1	06/08/21 15:08	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/12/21 11:10
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-INF-9	**Basis:**	NA
Lab Code:	K2105581-025		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**62.0**	ug/L	1.3	0.2	1	06/08/21 15:23	05/26/21	
Boron	200.8	**453**	ug/L	5.0	1.3	1	06/08/21 15:23	05/26/21	
Iron	200.8	**1280**	ug/L	5.0	0.8	1	06/08/21 15:23	05/26/21	
Lithium	200.8	**27.6**	ug/L	0.25	0.25	1	06/08/21 15:23	05/26/21	
Manganese	200.8	**8900**	ug/L	0.50	0.10	1	06/08/21 15:23	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/12/21 11:10
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-1-9	**Basis:**	NA
Lab Code:	K2105581-026		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.7**	ug/L	1.3	0.2	1	06/08/21 15:24	05/26/21	
Boron	200.8	**474**	ug/L	5.0	1.3	1	06/08/21 15:24	05/26/21	
Iron	200.8	**1.6 J**	ug/L	5.0	0.8	1	06/08/21 15:24	05/26/21	
Lithium	200.8	**10.5**	ug/L	0.25	0.25	1	06/08/21 15:24	05/26/21	
Manganese	200.8	**7930**	ug/L	0.50	0.10	1	06/08/21 15:24	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/12/21 11:10
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-2-9		**Basis:**	NA
Lab Code:	K2105581-027			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**12.4**	ug/L	1.3	0.2	1	06/08/21 15:26	05/26/21	
Boron	200.8	**458**	ug/L	5.0	1.3	1	06/08/21 15:26	05/26/21	
Iron	200.8	**1.4 J**	ug/L	5.0	0.8	1	06/08/21 15:26	05/26/21	
Lithium	200.8	**14.3**	ug/L	0.25	0.25	1	06/08/21 15:26	05/26/21	
Manganese	200.8	**8180**	ug/L	0.50	0.10	1	06/08/21 15:26	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/12/21 11:10
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-3-9		**Basis:**	NA
Lab Code:	K2105581-028			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**10.5**	ug/L	1.3	0.2	1	06/08/21 15:28	05/26/21	
Boron	200.8	**448**	ug/L	5.0	1.3	1	06/08/21 15:28	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:28	05/26/21	
Lithium	200.8	**19.8**	ug/L	0.25	0.25	1	06/08/21 15:28	05/26/21	
Manganese	200.8	**8080**	ug/L	0.50	0.10	1	06/08/21 15:28	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/12/21 11:10
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-4-9		**Basis:**	NA
Lab Code:	K2105581-029			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**21.7**	ug/L	1.3	0.2	1	06/08/21 15:29	05/26/21	
Boron	200.8	**452**	ug/L	5.0	1.3	1	06/08/21 15:29	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:29	05/26/21	
Lithium	200.8	**26.1**	ug/L	0.25	0.25	1	06/08/21 15:29	05/26/21	
Manganese	200.8	**8650**	ug/L	0.50	0.10	1	06/08/21 15:29	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/12/21 11:10
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-5-9	**Basis:**	NA
Lab Code:	K2105581-030		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**7.6**	ug/L	1.3	0.2	1	06/08/21 15:31	05/26/21	
Boron	200.8	**453**	ug/L	5.0	1.3	1	06/08/21 15:31	05/26/21	
Iron	200.8	**5.4**	ug/L	5.0	0.8	1	06/08/21 15:31	05/26/21	
Lithium	200.8	**27.4**	ug/L	0.25	0.25	1	06/08/21 15:31	05/26/21	
Manganese	200.8	**5920**	ug/L	0.50	0.10	1	06/08/21 15:31	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/18/21 11:15
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-INF-13		**Basis:**	NA
Lab Code:	K2105581-031			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**9.3**	ug/L	1.3	0.2	1	06/08/21 15:32	05/26/21	
Boron	200.8	**448**	ug/L	5.0	1.3	1	06/08/21 15:32	05/26/21	
Iron	200.8	**37.8**	ug/L	5.0	0.8	1	06/08/21 15:32	05/26/21	
Lithium	200.8	**26.4**	ug/L	0.25	0.25	1	06/08/21 15:32	05/26/21	
Manganese	200.8	**8720**	ug/L	0.50	0.10	1	06/08/21 15:32	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/18/21 11:15
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-1-13		**Basis:**	NA
Lab Code:	K2105581-032			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.8 J**	ug/L	1.3	0.2	1	06/08/21 15:34	05/26/21	
Boron	200.8	**446**	ug/L	5.0	1.3	1	06/08/21 15:34	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:34	05/26/21	
Lithium	200.8	**8.56**	ug/L	0.25	0.25	1	06/08/21 15:34	05/26/21	
Manganese	200.8	**6760**	ug/L	0.50	0.10	1	06/08/21 15:34	05/26/21	

Analytical Report

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water
Service Request: K2105581
Date Collected: 04/18/21 11:15
Date Received: 04/28/21 10:00

Sample Name: GSD-COL-2-13
Lab Code: K2105581-033
Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.8**	ug/L	1.3	0.2	1	06/08/21 15:36	05/26/21	
Boron	200.8	**441**	ug/L	5.0	1.3	1	06/08/21 15:36	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:36	05/26/21	
Lithium	200.8	**13.3**	ug/L	0.25	0.25	1	06/08/21 15:36	05/26/21	
Manganese	200.8	**7030**	ug/L	0.50	0.10	1	06/08/21 15:36	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/18/21 11:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-3-13	**Basis:**	NA
Lab Code:	K2105581-034		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**2.1**	ug/L	1.3	0.2	1	06/08/21 15:37	05/26/21	
Boron	200.8	**441**	ug/L	5.0	1.3	1	06/08/21 15:37	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:37	05/26/21	
Lithium	200.8	**18.8**	ug/L	0.25	0.25	1	06/08/21 15:37	05/26/21	
Manganese	200.8	**7330**	ug/L	0.50	0.10	1	06/08/21 15:37	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/18/21 11:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-4-13	**Basis:**	NA
Lab Code:	K2105581-035		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**7.8**	ug/L	1.3	0.2	1	06/08/21 15:45	05/26/21	
Boron	200.8	**448**	ug/L	5.0	1.3	1	06/08/21 15:45	05/26/21	
Iron	200.8	**0.8 J**	ug/L	5.0	0.8	1	06/08/21 15:45	05/26/21	
Lithium	200.8	**26.7**	ug/L	0.25	0.25	1	06/08/21 15:45	05/26/21	
Manganese	200.8	**8480**	ug/L	0.50	0.10	1	06/08/21 15:45	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/18/21 11:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-5-13	**Basis:**	NA
Lab Code:	K2105581-036		

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.0**	**J**	ug/L	1.3	0.2	1	06/08/21 15:46	05/26/21	
Boron	200.8	**426**		ug/L	5.0	1.3	1	06/08/21 15:46	05/26/21	
Iron	200.8	**0.9**	**J**	ug/L	5.0	0.8	1	06/08/21 15:46	05/26/21	
Lithium	200.8	**25.3**		ug/L	0.25	0.25	1	06/08/21 15:46	05/26/21	
Manganese	200.8	**6940**		ug/L	0.50	0.10	1	06/08/21 15:46	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/24/21 13:00
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-INF-1		**Basis:**	NA
Lab Code:	K2105581-037			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.7 J**	ug/L	1.3	0.2	1	06/08/21 15:59	05/26/21	
Boron	200.8	**6.5**	ug/L	5.0	1.3	1	06/08/21 15:59	05/26/21	
Iron	200.8	**1.8 J**	ug/L	5.0	0.8	1	06/08/21 15:59	05/26/21	
Lithium	200.8	**1.32**	ug/L	0.25	0.25	1	06/08/21 15:59	05/26/21	
Manganese	200.8	**10.4**	ug/L	0.50	0.10	1	06/08/21 15:59	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/24/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-1-1	**Basis:**	NA
Lab Code:	K2105581-038		

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND	U	ug/L	1.3	0.2	1	06/08/21 15:50	05/26/21	
Boron	200.8	**55.4**		ug/L	5.0	1.3	1	06/08/21 15:50	05/26/21	
Iron	200.8	**2.6**	**J**	ug/L	5.0	0.8	1	06/08/21 15:50	05/26/21	
Lithium	200.8	**2.21**		ug/L	0.25	0.25	1	06/08/21 15:50	05/26/21	
Manganese	200.8	**2030**		ug/L	0.50	0.10	1	06/08/21 15:50	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/24/21 13:00
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-2-1		**Basis:**	NA
Lab Code:	K2105581-039			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.5 J**	ug/L	1.3	0.2	1	06/08/21 15:51	05/26/21	
Boron	200.8	**36.6**	ug/L	5.0	1.3	1	06/08/21 15:51	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:51	05/26/21	
Lithium	200.8	**4.28**	ug/L	0.25	0.25	1	06/08/21 15:51	05/26/21	
Manganese	200.8	**2280**	ug/L	0.50	0.10	1	06/08/21 15:51	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/24/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-3-1	**Basis:**	NA
Lab Code:	K2105581-040		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.1 J**	ug/L	1.3	0.2	1	06/08/21 15:53	05/26/21	
Boron	200.8	**14.1**	ug/L	5.0	1.3	1	06/08/21 15:53	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 15:53	05/26/21	
Lithium	200.8	**4.08**	ug/L	0.25	0.25	1	06/08/21 15:53	05/26/21	
Manganese	200.8	**1820**	ug/L	0.50	0.10	1	06/08/21 15:53	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/24/21 13:00
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-4-1	**Basis:**	NA
Lab Code:	K2105581-041		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**4.9**	ug/L	1.3	0.2	1	06/08/21 16:04	05/26/21	
Boron	200.8	**14.3**	ug/L	5.0	1.3	1	06/08/21 16:04	05/26/21	
Iron	200.8	**1.1 J**	ug/L	5.0	0.8	1	06/08/21 16:04	05/26/21	
Lithium	200.8	**2.24**	ug/L	0.25	0.25	1	06/08/21 16:04	05/26/21	
Manganese	200.8	**398**	ug/L	0.50	0.10	1	06/08/21 16:04	05/26/21	

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2105581
Date Collected: 04/24/21 13:00
Date Received: 04/28/21 10:00

Sample Name: GSD-COL-DS-5-1
Lab Code: K2105581-042

Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.6 J**	ug/L	1.3	0.2	1	06/08/21 16:09	05/26/21	
Boron	200.8	**26.4**	ug/L	5.0	1.3	1	06/08/21 16:09	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 16:09	05/26/21	
Lithium	200.8	**6.12**	ug/L	0.25	0.25	1	06/08/21 16:09	05/26/21	
Manganese	200.8	**1980**	ug/L	0.50	0.10	1	06/08/21 16:09	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/25/21 13:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-INF-2	**Basis:**	NA
Lab Code:	K2105581-043		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.9 J**	ug/L	1.3	0.2	1	06/08/21 16:11	05/26/21	
Boron	200.8	**5.9**	ug/L	5.0	1.3	1	06/08/21 16:11	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 16:11	05/26/21	
Lithium	200.8	**1.35**	ug/L	0.25	0.25	1	06/08/21 16:11	05/26/21	
Manganese	200.8	**10.9**	ug/L	0.50	0.10	1	06/08/21 16:11	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/25/21 13:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-1-2	**Basis:**	NA
Lab Code:	K2105581-044		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND U	ug/L	1.3	0.2	1	06/08/21 16:12	05/26/21	
Boron	200.8	**38.9**	ug/L	5.0	1.3	1	06/08/21 16:12	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 16:12	05/26/21	
Lithium	200.8	**2.10**	ug/L	0.25	0.25	1	06/08/21 16:12	05/26/21	
Manganese	200.8	**1790**	ug/L	0.50	0.10	1	06/08/21 16:12	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	04/25/21 13:15
Sample Matrix:	Water		**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-2-2		**Basis:**	NA
Lab Code:	K2105581-045			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.4 J**	ug/L	1.3	0.2	1	06/08/21 16:14	05/26/21	
Boron	200.8	**16.6**	ug/L	5.0	1.3	1	06/08/21 16:14	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 16:14	05/26/21	
Lithium	200.8	**3.39**	ug/L	0.25	0.25	1	06/08/21 16:14	05/26/21	
Manganese	200.8	**2150**	ug/L	0.50	0.10	1	06/08/21 16:14	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/25/21 13:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-3-2	**Basis:**	NA
Lab Code:	K2105581-046		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**1.2 J**	ug/L	1.3	0.2	1	06/08/21 16:19	05/26/21	
Boron	200.8	**8.0**	ug/L	5.0	1.3	1	06/08/21 16:19	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 16:19	05/26/21	
Lithium	200.8	**3.22**	ug/L	0.25	0.25	1	06/08/21 16:19	05/26/21	
Manganese	200.8	**1270**	ug/L	0.50	0.10	1	06/08/21 16:19	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/25/21 13:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-4-2	**Basis:**	NA
Lab Code:	K2105581-047		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**5.1**	ug/L	1.3	0.2	1	06/08/21 16:20	05/26/21	
Boron	200.8	**9.8**	ug/L	5.0	1.3	1	06/08/21 16:20	05/26/21	
Iron	200.8	ND U	ug/L	5.0	0.8	1	06/08/21 16:20	05/26/21	
Lithium	200.8	**1.95**	ug/L	0.25	0.25	1	06/08/21 16:20	05/26/21	
Manganese	200.8	**250**	ug/L	0.50	0.10	1	06/08/21 16:20	05/26/21	

Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/25/21 13:15
Sample Matrix:	Water	**Date Received:**	04/28/21 10:00
Sample Name:	GSD-COL-DS-5-2	**Basis:**	NA
Lab Code:	K2105581-048		

Dissolved Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	**0.4**	**J**	ug/L	1.3	0.2	1	06/08/21 16:22	05/26/21	
Boron	200.8	**16.3**		ug/L	5.0	1.3	1	06/08/21 16:22	05/26/21	
Iron	200.8	ND	U	ug/L	5.0	0.8	1	06/08/21 16:22	05/26/21	
Lithium	200.8	**5.13**		ug/L	0.25	0.25	1	06/08/21 16:22	05/26/21	
Manganese	200.8	**1820**		ug/L	0.50	0.10	1	06/08/21 16:22	05/26/21	

QC Summary Forms

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Metals

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	KQ2108790-01		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND U	ug/L	0.50	0.09	1	06/08/21 13:00	05/26/21	
Boron	200.8	ND U	ug/L	2.0	0.5	1	06/08/21 13:00	05/26/21	
Iron	200.8	ND U	ug/L	2.0	0.3	1	06/08/21 13:00	05/26/21	
Lithium	200.8	ND U	ug/L	0.10	0.10	1	06/08/21 13:00	05/26/21	
Manganese	200.8	ND U	ug/L	0.20	0.04	1	06/08/21 13:00	05/26/21	

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Analytical Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	KQ2108791-01		

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND U	ug/L	0.50	0.09	1	06/08/21 14:53	05/26/21	
Boron	200.8	ND U	ug/L	2.0	0.5	1	06/08/21 14:53	05/26/21	
Iron	200.8	ND U	ug/L	2.0	0.3	1	06/08/21 14:53	05/26/21	
Lithium	200.8	ND U	ug/L	0.10	0.10	1	06/08/21 14:53	05/26/21	
Manganese	200.8	ND U	ug/L	0.20	0.04	1	06/08/21 14:53	05/26/21	

Client:	Anchor QEA, LLC		**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02		**Date Collected:**	NA
Sample Matrix:	Water		**Date Received:**	NA
Sample Name:	Method Blank		**Basis:**	NA
Lab Code:	KQ2108793-01			

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic	200.8	ND U	ug/L	0.50	0.09	1	06/08/21 16:01	05/26/21	
Boron	200.8	**0.6 J**	ug/L	2.0	0.5	1	06/08/21 16:01	05/26/21	
Iron	200.8	ND U	ug/L	2.0	0.3	1	06/08/21 16:01	05/26/21	
Lithium	200.8	ND U	ug/L	0.10	0.10	1	06/08/21 16:01	05/26/21	
Manganese	200.8	ND U	ug/L	0.20	0.04	1	06/08/21 16:01	05/26/21	

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/8/21
		Date Extracted:	05/26/21

Matrix Spike Summary
Dissolved Metals

Sample Name:	GSD-COL-1-1	**Units:**	ug/L
Lab Code:	K2105581-002	**Basis:**	NA
Analysis Method:	200.8		
Prep Method:	EPA CLP ILM04.0		

Matrix Spike
KQ2108790-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	0.3 J	128	125	102	70-130
Boron	351	419	62.5	110 #	70-130
Iron	1.0 J	128	125	102	70-130
Lithium	0.28	130	125	104	70-130
Manganese	3050	3170	62.5	190 #	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Matrix Spike and Matrix Spike Duplicate Data is presented for information purposes only. The matrix may or may not be relevant to samples reported in this report. The laboratory evaluates system performance based on the LCS and LCSD control limits.

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/8/21
		Date Extracted:	05/26/21

Matrix Spike Summary
Dissolved Metals

Sample Name:	GSD-COL-2-1	**Units:**	ug/L
Lab Code:	K2105581-003	**Basis:**	NA
Analysis Method:	200.8		
Prep Method:	EPA CLP ILM04.0		

Matrix Spike
KQ2108790-08

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	ND U	125	125	100	70-130
Boron	214	272	62.5	92	70-130
Iron	0.8 J	127	125	101	70-130
Lithium	ND U	129	125	103	70-130
Manganese	2400	2440	62.5	70 #	70-130

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Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/8/21
		Date Extracted:	05/26/21

Matrix Spike Summary
Dissolved Metals

Sample Name:	GSD-COL-3-7	**Units:**	ug/L
Lab Code:	K2105581-022	**Basis:**	NA
Analysis Method:	200.8		
Prep Method:	EPA CLP ILM04.0		

Matrix Spike
KQ2108791-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	13.0	140	125	101	70-130
Boron	448	504	62.5	89 #	70-130
Iron	0.8 J	126	125	100	70-130
Lithium	20.0	143	125	98	70-130
Manganese	7840	7950	62.5	176 #	70-130

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/8/21
		Date Extracted:	05/26/21

Matrix Spike Summary
Dissolved Metals

Sample Name:	GSD-COL-4-7	**Units:**	ug/L
Lab Code:	K2105581-023	**Basis:**	NA
Analysis Method:	200.8		
Prep Method:	EPA CLP ILM04.0		

Matrix Spike
KQ2108791-08

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	22.3	149	125	102	70-130
Boron	451	513	62.5	99 #	70-130
Iron	0.9 J	128	125	101	70-130
Lithium	26.9	152	125	100	70-130
Manganese	8740	8710	62.5	-56 #	70-130

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/24/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/8/21
		Date Extracted:	05/26/21

Matrix Spike Summary
Dissolved Metals

Sample Name:	GSD-COL-DS-4-1	**Units:**	ug/L
Lab Code:	K2105581-041	**Basis:**	NA
Analysis Method:	200.8		
Prep Method:	EPA CLP ILM04.0		

Matrix Spike
KQ2108793-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	4.9	133	125	102	70-130
Boron	14.3	75.8	62.5	98	70-130
Iron	1.1 J	129	125	102	70-130
Lithium	2.24	121	125	95	70-130
Manganese	398	451	62.5	84 #	70-130

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Results flagged with a pound (#) indicate the control criteria is not applicable.

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/08/21

Replicate Sample Summary
Dissolved Metals

Sample Name:	GSD-COL-1-1	**Units:**	ug/L
Lab Code:	K2105581-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ2108790-05 Result	Average	RPD	RPD Limit
Arsenic	200.8	1.3	0.2	0.3 J	0.2 J	0.3	40 #	20
Boron	200.8	5.0	1.3	351	354	353	<1	20
Iron	200.8	5.0	0.8	1.0 J	ND U	NC	NC	20
Lithium	200.8	0.25	0.25	0.28	0.26	0.27	7	20
Manganese	200.8	0.50	0.10	3050	3140	3100	3	20

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Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/07/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/08/21

Replicate Sample Summary
Dissolved Metals

Sample Name:	GSD-COL-2-1	**Units:**	ug/L
Lab Code:	K2105581-003	**Basis:**	NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ2108790-07 Result	Average	RPD	RPD Limit
Arsenic	200.8	1.3	0.2	ND U	ND U	ND	-	20
Boron	200.8	5.0	1.3	214	207	211	3	20
Iron	200.8	5.0	0.8	0.8 J	0.8 J	0.8	<1	20
Lithium	200.8	0.25	0.25	ND U	ND U	ND	-	20
Manganese	200.8	0.50	0.10	2400	2370	2390	1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/08/21

Replicate Sample Summary
Dissolved Metals

Sample Name:	GSD-COL-3-7	**Units:**	ug/L
Lab Code:	K2105581-022	**Basis:**	NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ2108791-05 Result	Average	RPD	RPD Limit
Arsenic	200.8	1.3	0.2	13.0	13.3	13.2	2	20
Boron	200.8	5.0	1.3	448	452	450	<1	20
Iron	200.8	5.0	0.8	0.8 J	0.9 J	0.9	12	20
Lithium	200.8	0.25	0.25	20.0	20.1	20.1	<1	20
Manganese	200.8	0.50	0.10	7840	7850	7850	<1	20

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/10/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/08/21

Replicate Sample Summary
Dissolved Metals

Sample Name:	GSD-COL-4-7	**Units:**	ug/L
Lab Code:	K2105581-023	**Basis:**	NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ2108791-07 Result	Average	RPD	RPD Limit
Arsenic	200.8	1.3	0.2	22.3	21.9	22.1	2	20
Boron	200.8	5.0	1.3	451	454	453	<1	20
Iron	200.8	5.0	0.8	0.9 J	0.9 J	0.9	<1	20
Lithium	200.8	0.25	0.25	26.9	27.5	27.2	2	20
Manganese	200.8	0.50	0.10	8740	8620	8680	1	20

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Results flagged with a pound (#) indicate the control criteria is not applicable.

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project	CCR-GSD/201114-03.02 Task 02	**Date Collected:**	04/24/21
Sample Matrix:	Water	**Date Received:**	04/28/21
		Date Analyzed:	06/08/21

Replicate Sample Summary
Dissolved Metals

Sample Name:	GSD-COL-DS-4-1	**Units:**	ug/L
Lab Code:	K2105581-041	**Basis:**	NA

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ2108793-03 Result	Average	RPD	RPD Limit
Arsenic	200.8	1.3	0.2	4.9	5.1	5.0	4	20
Boron	200.8	5.0	1.3	14.3	13.1	13.7	9	20
Iron	200.8	5.0	0.8	1.1 J	1.2 J	1.2	9	20
Lithium	200.8	0.25	0.25	2.24	2.24	2.24	<1	20
Manganese	200.8	0.50	0.10	398	397	398	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	06/08/21
Sample Matrix:	Water		

Lab Control Sample Summary
Dissolved Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ2108790-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	200.8	49.8	50.0	100	85-115
Boron	200.8	24.2	25.0	97	85-115
Iron	200.8	50.6	50.0	101	85-115
Lithium	200.8	50.3	50.0	101	85-115
Manganese	200.8	24.4	25.0	98	85-115

Client: Anchor QEA, LLC
Project: CCR-GSD/201114-03.02 Task 02
Sample Matrix: Water

Service Request: K2105581
Date Analyzed: 06/08/21

Lab Control Sample Summary
Dissolved Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ2108791-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	200.8	50.1	50.0	100	85-115
Boron	200.8	24.4	25.0	98	85-115
Iron	200.8	50.2	50.0	100	85-115
Lithium	200.8	50.6	50.0	101	85-115
Manganese	200.8	25.3	25.0	101	85-115

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Anchor QEA, LLC	**Service Request:**	K2105581
Project:	CCR-GSD/201114-03.02 Task 02	**Date Analyzed:**	06/08/21
Sample Matrix:	Water		

Lab Control Sample Summary
Dissolved Metals

Units: ug/L
Basis: NA

Lab Control Sample
KQ2108793-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	200.8	49.8	50.0	100	85-115
Boron	200.8	25.0	25.0	100	85-115
Iron	200.8	50.3	50.0	101	85-115
Lithium	200.8	48.3	50.0	97	85-115
Manganese	200.8	25.2	25.0	101	85-115