GROUNDWATER MONITORING PLAN FOR INACTIVE CCR LANDFILL

FORMER PLANT ARKWRIGHT – AP1 LANDFILL

MACON-BIBB COUNTY, GEORGIA

FOR

Georgia Power

October 2021

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No. PG002110
10/1/2021

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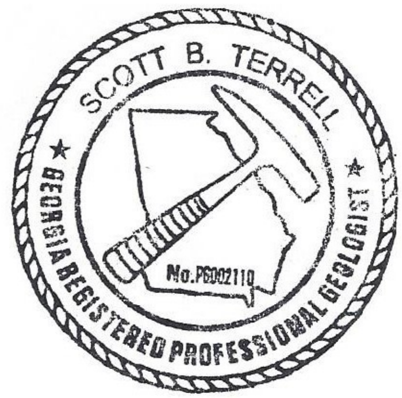
1. CERTIFICATION

I hereby certify that this Groundwater Monitoring Plan was prepared by, or under the direct supervision of, a "Qualified Groundwater Scientist," in accordance with the Rules of Solid Waste Management. According to 391-3-4-.01(58), a Qualified Groundwater Scientist is "a professional engineer or geologist registered to practice in Georgia who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields that enable individuals to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action." The design of the groundwater monitoring system was developed in compliance with the Rules of Solid Waste Management, Chapter 391-3-4-.10(6), as specified in 391-3-.14(11)(b).

Signature: Scott B Terrell

Date: October 1, 2021



2. INTRODUCTION

Groundwater monitoring is required by EPD to detect and quantify potential changes in groundwater chemistry. This Groundwater Monitoring Plan (plan) describes the groundwater monitoring program for the Former Plant Arkwright's AP1 Landfill (site). This plan meets the requirements of EPD rules and uses EPD's Manual for Groundwater Monitoring dated September 1991 as a guide. Groundwater sampling locations for the site are presented in **Figure 1 of Appendix A**.

Monitoring will occur in accordance with 391-3-4-.10 of the Georgia Solid Waste Management Rules. If the monitoring requirements specified in this plan conflict with EPD rules (391-3-4), the EPD rules will take precedent.

Former Plant Arkwright's AP1 Landfill is located in Bibb County, approximately six miles northwest of Macon, Georgia. AP1 Landfill is positioned immediately south of the former plant area and is bordered by the Ocmulgee River to the east, Beaverdam Creek to the south, and a Norfolk Southern Railroad to the west. The site was constructed prior to 1958 and covers approximately 31 acres. AP1 Landfill was closed with two feet of soil cover in 1990. Regrading and slope stability improvements were completed in 2004 and 2007. A closure completion report was submitted to EPD in 2008. After completing a technical and administrative review of the closure documentation and inspection of the site, EPD issued a Closure Certificate for AP1 Landfill in 2010.

Per the Closure Plan, CCR will be removed from AP1 Landfill, which will significantly affect final (closure) topography and may also affect the site's potentiometric surface. One pre-existing beneficial reuse area will remain onsite after excavation. This area is being used to support an existing power pole within the permit boundary. This plan has been generated with consideration to these factors and in accordance with Solid Waste Management Rule 391-3-4-.10(6).

3. GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

Geologic conditions for this site are described in the "Limited Hydrogeologic Assessment Report, Former Plant Arkwright – AP1 Landfill" provided in the November 2018 solid waste handling permit application. A summary of the site geology and hydrogeology is provided below.

AP1 Landfill is generally underlain by alluvial sands of varying grainsizes, with minor lenses of clay. More consolidated sediments include fine to medium sandy silt to silty sand, which is underlain by silty sand saprolite. Borehole drilling performed at the site indicates overburden thickness ranging from 22 feet to 62 feet, overlying a thin layer (5 to 10 feet) of partially weathered rock. The underlying bedrock consist of quartzofeldspathic gneiss, horneblende gneiss and schist.

An interim well network at the AP1 Landfill was installed following the guidelines presented in this plan and consists of two upgradient wells (AP1GWA-1 and 2) and eleven downgradient wells (AP1-PZ1 through AP1-PZ11) as shown in **Figure 2 of Appendix A**. A summary table of temporary monitoring well details for the interim monitoring wells are provided in **Table A1 of Appendix A.** Based on a recent groundwater level gauging event, the potentiometric surface ranges from approximately 323 – 290 feet above mean sea level (MSL) (18 – 58 feet below ground surface) respectively in the northern and southern portions of the site. A potentiometric surface map of the AP1 Landfill area is provided as **Figure 2 of Appendix A**. These interim wells were installed to evaluate the uppermost occurrence of groundwater at the site prior to CCR removal and will be abandoned during construction activities associated with the removal activities. The uppermost aquifer typically occurs within the alluvial sediments and residual soils above bedrock. The site is bordered to the east by the Ocmulgee River, and to the west and south by Beaverdam Creek, both of which influence the potentiometric surface.

The groundwater hydraulic gradients within the uppermost aquifer beneath AP1 were calculated using the groundwater elevation data from the July 13, 2021 gauging event. Hydraulic gradients were calculated along the northeast flow path at the north end of AP1 between wells AP1PZ-11 and AP1-PZ-1 and at the southerly flow path on the southwest side of AP1 between AP1PZ-9 and AP1-PZ-8. The average hydraulic gradients along the northern and southerly groundwater flow path lines associated with AP1 are 0.031 feet per foot (ft/ft) and 0.012 ft/ft, respectively. The supporting calculations are presented in **Table A2 of Appendix A**. The general trajectory of the flow paths used in the calculations and associated potentiometric contour lines are shown on **Figure 2 of Appendix A**.

With these variables determined, and accounting for the averaged hydraulic gradient discussed above for July 13, 2021 event, the average groundwater flow velocity in the vicinity of AP1 was calculated to be 27.4 ft/day (i.e., average of the northeasterly and southerly flow velocities). The flow velocity calculations are provided in **Table A2 of Appendix A**.

4. SELECTION OF WELL LOCATIONS

The recently installed interim well network at the AP1 Landfill consists of two upgradient wells (AP1GWA-1 and 2) and eleven downgradient wells (AP1-PZ1 through AP1-PZ11) **Figure 2 of Appendix A**. A summary table of temporary monitoring well details for the interim monitoring wells are provided in **Table A1 of Appendix A**. A copy of the drillers bond that was on file with the Water Well Standards Advisory Council at the time of well installation for the interim monitoring network is provided in **Appendix A**. Since CCR will be removed from AP1 Landfill, the eleven downgradient wells will be abandoned as part of removal activities. The two upgradient wells (AP1GWA-1 and 2) may remain throughout removal activities and be incorporated into AP1 Landfill's permitted groundwater monitoring network. Following removal of CCR, approximately 20 additional groundwater monitoring wells will be installed as shown in **Figure 1 of Appendix A**. As required by 391-3-4.10(6)(g), a minor modification will be submitted to EPD prior to the installation or decommissioning of monitoring wells. Well installation and abandonment will be directed by a qualified groundwater scientist. Any changes to the monitoring network, as shown in **Figure 1 of Appendix A**, will be incorporated via a minor modification to the GWMP.

As mentioned previously, CCR will be removed from AP1 Landfill, which will significantly lower the site's topography and may also affect the potentiometric surface during post-closure. However, it is not expected that removal of CCR will affect the general groundwater flow direction toward the Ocmulgee River and Beaverdam Creek.

5. GROUNDWATER MONITORING WELL DESIGN AND CONSTRUCTION

Groundwater monitoring wells will be installed to monitor the uppermost occurrence of groundwater beneath the site. Proposed locations are selected based on site geologic and hydrogeologic considerations, following the recommendation as stated in Chapter 2 of the Manual for Groundwater Monitoring (1991) to determine well spacing based on site-specific conditions. Locations are chosen to serve as upgradient (GWA), lateral (GWB), or downgradient (GWC) based on groundwater flow direction determined by potentiometric evaluation. The well naming nomenclature is based on Georgia EPD's Industrial Waste Disposal Site Design and Operations Plan – Supplemental Data for Solid Waste Handling Permit (undated).

Monitoring wells will generally be located outside of areas with frequent auto traffic; however, wells may be installed in heavily trafficked areas when necessary to meet the groundwater monitoring objectives of EPD rules.

5.1 DRILLING METHODS

A variety of well drilling methods are available for the purpose of installing groundwater wells. Drilling methodology may include, but not be limited to: hollow stem augers, direct push, air rotary, mud rotary, or rotosonic techniques. The drilling method shall minimize the disturbance of subsurface materials and shall not cause impact to the groundwater. Borings will be advanced using an appropriate drilling technology capable of drilling and installing a well in site-specific geology. Monitoring wells will be installed using the most current version of the USEPA SESD SESDGUID-101-R1 as a general guide for best practices. Drilling equipment shall be decontaminated before use and between borehole locations using the procedures described in the latest version of the U.S. Environmental Protection Agency (USEPA) Region 4 Science and Ecosystem Support Division Operating Procedure for Field Equipment Cleaning and Decontamination as a guide.

Sampling and/or coring may be used to help determine the stratigraphy and geology. Samples will be logged under the direction of a qualified groundwater scientist. Screen depths will be chosen based on the depth of the uppermost aquifer.

All drilling for any subsurface hydrologic investigation, installation or abandonment of groundwater wells at a landfill in Georgia must be performed by a driller that has, at the time of the field operation, a performance bond on file with the Water Well Standards Advisory Council. Drilling and well installation activities will be directed by a qualified groundwater scientist.

5.2 MONITORING WELL CONSTRUCTION MATERIALS AND REPORTING

Well construction materials shall be sufficiently durable to resist chemical and physical degradation and will not interfere with the quality of groundwater samples collected. The groundwater monitoring well details presented in **Appendix B**, Groundwater Well Details, illustrates the general design and construction details for a monitoring well.

a) Well Casings and Screens

American Society for Testing and Materials International (ASTM), Nation Science Foundation (NSF) rated, Schedule 40, 2-inch polyvinyl chloride (PVC) pipe with flush threaded connections will be used for the well riser and screens. Compounds that can cause PVC to deteriorate (e.g., organic compounds) are not expected at this facility. If conditions warrant, other appropriate materials may be used for construction with prior written approval from the EPD.

b) Well Intake Design

The design and construction of the intake of the groundwater wells shall: (1) allow sufficient groundwater flow to the well for sampling; (2) minimize the passage of formation materials (turbidity) into the well; and (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

Each groundwater monitoring well will include a well screen designed to limit the amount of formation material passing into the well when it is purged and sampled. Screens with 0.010-inch slots have proven effective for the earth materials at the site and will be used unless geologic conditions discovered at the time of installation dictate a different size. Screen length shall not exceed 10 feet without justification as to why a longer screen is necessary (e.g. significant variation in groundwater level). If the above prove ineffective for developing a well with sufficient yield or acceptable turbidity, further steps will be taken to assure that the well screen is appropriately sized for the formation material. This may include performing sieve analysis of the formation material and determining well screen slot size based on the grain size distribution.

Pre-packed dual-wall well screens may be used for well construction. Pre-packed well screens combine a centralized inner well screen, a developed filter sand pack, and an outer conductor screen in one integrated unit composed of inert materials. Pre-packed well screens will be installed following general industry standards and using the latest version of the Region 4 U.S. Environmental Protection Agency Science and Ecosystem Support Division Operating Procedure for Design and Installation of Monitoring Wells as a general guide. If the dual-wall pre-packed-screened wells do not yield sufficient water or are excessively turbid after development, further steps will be taken to assure that the well screen is appropriately sized for the formation material. This may include performing sieve analysis of the formation material and determining well screen slot size based on the grain size distribution.

c) Filter Pack and Annular Sealant

The materials used to construct the filter pack will be clean quartz sand of a size that is appropriate for the screened formation. Fabric filters will not be used as filter pack material. Sufficient filter material will be placed in the hole and measurements taken to ensure that no bridging occurs. Upon placement of the filter pack, the well may be pumped to assure settlement of the pack. If pumping is performed, the top of filter pack depth will be measured and additional sand added if necessary. The filter pack will extend approximately one to two feet above the top of the well screen.

The materials used to seal the annular space must prevent hydraulic communication between strata and prevent migration from overlying areas into the well screen interval. A minimum of two feet of bentonite (chips, pellets, or slurry) will be placed immediately above the filter pack. The bentonite seal will extend up to the base of any overlying confining zone or the top of the water-bearing zone to prevent cementitous grout from entering the water-bearing or screened zone. If dry bentonite is used, the bentonite must be hydrated with potable water prior to grouting the remaining annulus.

The annulus above the bentonite seal will be grouted with a cement and bentonite mixture (approximately 94 pounds cement / 3 to 5 pounds bentonite / 6.5 gallons of potable water) placed via tremie pipe from the top of the bentonite seal. During grouting, care will be taken to assure that the bentonite seal is not disturbed by locating the base of the tremie pipe approximately 2 feet above the bentonite seal and injecting grout at low pressure/velocity.

d) Protective Casing and Well Completion

After allowing the grout to settle, the well will be finished by installing a flush-mount or above-ground protective casing as appropriate, and building a surface cap. The use of flush-mount wells will generally be limited to paved surfaces unless site operations warrant otherwise. The surface cap will extend from the top of the cementitous grout to ground surface, where it will become a concrete apron extending outward with a radius of at least 3 feet from the edge of the well casing and sloped to drain water away from the well.

A vent hole will be installed in each wells PVC casing (below the cap) to allow the pressure in the well to equalize with atmospheric pressure. In wells with above-ground protection, the space between the well casing and the protective casing will be filled with coarse sand or pea-gravel to within approximately 6 inches of the top of the well casing. A small weep hole will be drilled at the base of the metal casing for the drainage of moisture from the casing. Above ground protective covers will be locked.

Protective bollards will be installed around each above-grade groundwater monitoring well. Well construction in high traffic areas will generally be limited unless site conditions warrant otherwise.

e) Well Development

After well construction is completed, wells will be developed by alternately purging and surging until relatively clear discharge water with little turbidity is observed. The goal will be to achieve a turbidity of less than 5 nephelometric turbidity units (NTUs); however, formation-specific conditions may not allow this target to be accomplished. Development can be discontinued once a minimum turbidity of 10 NTU is achieved. Additionally, the stabilization criteria contained in **Appendix C** should be met. A variety of techniques may be used to develop site groundwater monitoring wells. The method used must create reversals or surges in flow to eliminate bridging by particles around the well screen. These reversals or surges can be created by using surge blocks, bailers, or pumps. The wells will be developed using a pump capable of inducing the stress necessary to achieve the development goals. All development equipment will be decontaminated prior to first use and between wells.

In low yielding wells, potable water may be added to the well to facilitate surging of the well screen interval and removal of fine-grained sediment. If water is added, the volume will be documented and at minimum, an equal volume purged from the well.

Many geologic formations contain clay and silt particles that are small enough to work their way through the wells' filter packs over time. Therefore, the turbidity of the groundwater from the monitoring wells may gradually increase over time after initial well development. As a result, the monitoring wells may have to be redeveloped periodically to remove the silt and clay that has worked its way into the filter pack of the monitoring wells. Each monitoring well should be redeveloped when sample turbidity values have significantly increased since initial development or since prior redevelopment. The redevelopment should be performed as described above. Well development will be conducted under supervision of a qualified groundwater scientist. Well development data will be provided as part of the well installation report.

f) Documentation of Well Design and Construction

The following information, documenting the construction of each well, will be submitted in report form to EPD by a qualified groundwater scientist within 60 days after all field work is complete (i.e., well installation, well development, and survey) or after abandonment.

- Well identification
- Name of driller and identification of drill rig;
- Documentation that the driller, at the time the monitoring wells were installed, had a bond on file with the Water Well Standards Advisory Council;
- Date/time of construction;
- Drilling method and drilling fluid if used;
- Borehole diameter and well casing diameter;
- Drilling and lithologic logs;

- Casing materials;
- Screen materials and design;
- Casing and screen joint type;
- Screen slot size/length;
- Filter pack material/size;
- Filter pack volume;
- Filter pack placement method;
- Sealant materials;
- Sealant volume;
- Sealant placement method;
- Surface seal design/construction,
- Well development date and procedures;
- Well turbidity following development;
- Type of protective well cap and sump dimensions for each well;
- Documentation stating that a Georgia-registered professional surveyor shall certify that the horizontal accuracy for the installed monitoring wells is 0.5 feet, and vertical accuracy for top of casing elevations to 0.01 feet using a known datum;
- Well depth (±0.1 ft.);
- Ground surface elevation (±0.01 ft.);
- Top of casing elevation (±0.01 ft.); and
- Detailed drawing of well (include dimensions).

g) Well Abandonment

Per Georgia Rule 391-3-4-.10(6)(g), monitoring wells require abandonment and replacement after two consecutive dry sampling events, unless an alternate schedule is approved by the GA EPD. Monitoring wells will be abandoned using industry-accepted practices and using the Manual for Groundwater Monitoring (1991) and Georgia Water Well Standards Act (1985) as guides. The wells will be abandoned under the direction of a qualified groundwater scientist. Neat Portland cement or bentonite will be used as appropriate to complete abandonment and seal the well borehole.

6. MONITORING PARAMETERS AND FREQUENCY

The following describes groundwater sampling requirements with respect to parameters for analysis, sampling frequency, sample preservation and shipment, and analytical methods. Groundwater samples used to provide compliance monitoring data will not be filtered prior to collection.

Groundwater monitoring parameters and sampling frequency are presented in **Table 1**, below. A minimum of eight independent samples from each groundwater well will be collected and analyzed for 40 CFR 257, Subpart D, Appendix III and Appendix IV test parameters to establish a background statistical dataset. Subsequently, in accordance with 391-3-4-.10(6), the monitoring frequency will be semi-annual. If required, assessment monitoring will be performed per Georgia Chapter 391-3-4-.10, Rules for Solid Waste Management.

When referenced throughout this plan, Appendix III and Appendix IV parameters refer to the parameters contained in Appendix III and Appendix IV of 40 CFR 257, Subpart D, 80 Fed. Reg. 21468 (April 17, 2015).

As shown on Table 2, Analytical Methods, the groundwater samples will be analyzed using methods specified in USEPA Manual SW-846, EPA 600/4-79-020, Standard Methods for the Examination of Water and Wastewater (SM18-20), USEPA Methods for the Chemical Analysis of Water and Wastes (MCAWW), American Society for Testing and Materials (ASTM), or other suitable analytical methods approved by the Georgia EPD. The method used will be able to reach a suitable practical quantification limit to detect natural background conditions at the facility. Field instruments used to measure pH must be accurate and reproducible to within 0.1 Standard Units (S.U.).

TABLE 1. GROUNDWATER MONITORING PARAMETERS AND FREQUENCY

MONITORING PARAMETER		GROUNDWATER MONITORING	
		Background	Semi-Annual Events
Field Parameters	Temperature	X	X
	pH	X	X
	Specific Conductance	X	X
	ORP	X	X
	Turbidity	X	X
	Dissolved Oxygen	X	X
Appendix III (Detection)	Boron	X	X
	Calcium	X	X
	Chloride	X	X
	Fluoride	X	X
	pH (field)	X	X
	Sulfate	X	X
	Total Dissolved Solids	X	X
Appendix IV (Assessment)	Antimony	X	X
	Arsenic	X	X
	Barium	X	X
	Beryllium	X	X
	Cadmium	X	X
	Chromium	X	X
	Cobalt	X	X
	Fluoride	X	X
	Lead	X	X
	Lithium	X	X
	Mercury	X	X
	Molybdenum	X	X
	Selenium	X	X
	Thallium	X	X
	Radium 226 & 228	X	X

TABLE 2. ANALYTICAL METHODS

Parameters	EPA Method Number
Boron	6010D/6020B
Calcium	6010D/6020B
Chloride	300.0/300.1/9250/9251/9253/9056A
Fluoride	300.0/300.1/9214/9056A
pH	150.1field/90405C
Sulfate	9035/9036/9038/300.0/300.1/9056A
Total Dissolved Solids (TDS)	160/2540C
Antimony	7040/7041/6010D/6020B
Arsenic	7060A/7061A/6010D/6020B
Barium	7080A/7081/6010D/6020B
Beryllium	7090/7091/6010D/6020B
Cadmium	7130/7131A/6020B
Chromium	7190/7191/6010D/6020B
Cobalt	7200/7201/6010D/6020B
Fluoride	300.0/300.1/9214/90569214
Lead	7420/7421/6010D/6020B
Lithium	6010D/6020B
Mercury	7470
Molybdenum	6010D/6020B
Selenium	7740/7741A/6010D/6020B
Thallium	7840/7841/6010D/6020B
Radium 226 and 228 combined	903/9320/9315

7. SAMPLE COLLECTION

During each sampling event, samples will be collected and handled in accordance with the procedures specified in **Appendix C**, Groundwater Sampling Procedure. Sampling procedures were developed using standard industry practice and USEPA Region 4 Field Branches Quality System and Technical Procedures as a guide. Low-flow sampling methodology will be utilized for sample collection. EPA approved alternative industry accepted sampling techniques may be used when appropriate. The applied groundwater purging and sampling methodologies will be discussed in the groundwater semi-annual monitoring reports submitted to EPD.

Teflon™ lined, positive gas displacement PVC or stainless steel bladder pumps will be used for purging. If dedicated bladder pumps are not used, portable bladder pumps or peristaltic pumps (with dedicated or disposable tubing) may be used. When non-dedicated equipment is used, it will be decontaminated prior to use and between wells.

Per Georgia Rule 391-3-4-.10(6)(g), monitoring wells require replacement after two consecutive dry sampling events. Well installation must be directed by a qualified groundwater scientist. A minor modification will be submitted in accordance with 391-3-4.02(3)(b)(6) prior to the installation or decommissioning of monitoring wells.

8. CHAIN-OF-CUSTODY

Samples will be handled under chain-of-custody (COC) procedures beginning in the field. The COC record will contain the following information:

- Sample identification numbers
- Signature of collector
- Date and time of collection
- Sample type
- Sample point identification
- Number of sample containers
- Signature of person(s) involved in the chain of possession
- Dates and times of transfer/possession by each individual
- Notated date(s) and time(s) of sample transfer between individuals

The samples will remain in the custody of assigned personnel, an assigned agent, or the laboratory. If the samples are transferred to other employees for delivery or transport, the sampler or possessor must relinquish possession and the samples must be received by the new owner.

If the samples are being shipped, a hard copy COC will be signed and enclosed within the shipping container.

Samplers must use COC forms provided by the analytical laboratory or use a COC form similarly formatted and containing the information listed above.

9. FIELD AND LABORATORY QUALITY ASSURANCE / QUALITY CONTROL

Calibration of field instruments will occur daily and follow the recommended (specific) instrument calibration procedures provided by the manufacturer and /or equipment manual specific to each instrument. Daily calibration will be documented on field forms and these field forms will be included in all groundwater monitoring reports. Instruments will be recalibrated as necessary (e.g. when calibration checks indicate significant variability), and all checks and recalibration steps will be documented on field calibration forms. Calibration of the instruments will also be checked if any readings during sampling activities are suspect. Replacement probes and meters will be obtained as a corrective action in the event that recalibration does not improve instrument function. Calibration field forms will be provided as part of each groundwater report's quality control documentation.

All field quality control samples will be prepared the same as compliance samples with regard to sample volume, containers, and preservation. The following quality control samples will be collected during each sampling event:

- Field Equipment Rinsate Blanks - Where sampling equipment is not new or dedicated, an equipment rinsate blank will be collected at a rate of one blank per 10 samples using non-dedicated equipment.
- Field Duplicates - Field duplicates are collected by filling additional containers at the same location, and the field duplicate is assigned a unique sample identification number. One blind field duplicate will be collected for every 20 samples.
- Field Blanks - Field blanks are collected in the field using the same water source that is used for decontamination. The water is poured directly into the supplied sample containers in the field and submitted to the laboratory for analysis of target constituents. One field blank will be collected for every 20 samples.

A custody seal shall be placed on each shipping cooler or shipping container. Custody seals on sample containers serve two purposes: to prevent accidental opening of the shipping container and to provide visual evidence should the container be opened or tampered with. The use of custody seals controls the loss of samples and provides direct evidence whether sample containers have been opened and possibly compromised.

The groundwater samples will be analyzed by licensed and accredited laboratories through the National Environmental Laboratory Accreditation Program (NELAP).

10. REPORTING RESULTS

A semi-annual groundwater report that documents the results of sampling and analysis will be submitted to EPD. Semi-annual groundwater monitoring reports will be submitted to EPD within 90 days of receipt and analysis of the groundwater analytical data from the laboratory. At a minimum, semi-annual reports will include:

1) A narrative describing sampling activities and findings including a summary of the number of samples collected, the dates the samples were collected and whether the samples were required by the detection or assessment monitoring programs.
2) A brief overview of purging/sampling methodologies and equipment used.
3) Discussion of results.
4) Recommendations for the future monitoring consistent with the rules.
5) Potentiometric surface contour map for the aquifer(s) being monitored, signed and sealed by a Georgia-registered P.G. or P.E.
6) Table of as-built information for groundwater monitoring wells including top of casing elevations, ground elevations, screened elevations, current groundwater elevations and depth to water measurements.
7) Groundwater flow rate and direction calculations.
8) Identification of any groundwater wells that were installed or decommissioned during the preceding year, along with a narrative description of why these actions were taken.

9) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels.
10) Semi-annual assessment monitoring results (if applicable).
11) Any alternate source demonstration completed during the previous monitoring period (if applicable).
12) Laboratory Reports.
13) COC documentation.
14) Field sampling logs including field instrument calibration, indicator parameters and parameter stabilization data.
15) Field logs and forms for each sampling event to include, but not limited to, field calibration forms, well signage, well access, sampling and purging equipment condition, and any site conditions that may affect sampling.
16) Documentation of non-functioning wells.
17) Table of current analytical results for each well, highlighting statistically significant increases and concentrations above maximum contaminant level (MCL).
18) Statistical analyses.
19) Certification by a qualified groundwater scientist.
20) Plume delineation (if applicable).
21) Trend charts (if applicable).
22) Updated potable water well survey (if applicable).

11. STATISTICAL ANALYSIS

Groundwater quality data from each sampling event will be statistically evaluated to determine if there has been a statistically significant change in groundwater chemistry. Background data will be used to determine statistical limits.

According to EPD Rule 391-3-4-.10(6)(a), which incorporates the statistical analysis requirements of 40 CFR 257.93 by reference, the site must specify in the operating record the statistical methods to be used in evaluating groundwater monitoring data for each identified constituent. The statistical test chosen shall be conducted separately for each constituent in each well. As authorized by the rule, statistical tests that will be used include:

1) A prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper prediction limit. (§257.93(f)(3)).
2) A control chart approach that gives control limits for each constituent. (§257.93(f)(4)).
3) Another statistical test method (such as prediction limits or control charts) that meets the performance standards of §257.93(g). A justification for an alternative method will be placed in the operating record and the Director notified of the use of an alternative test. The justification will demonstrate that the alternative method meets the performance standards of §257.93(g).

An interwell statistical method will be used to compare Appendix III groundwater monitoring data to background conditions. Confidence intervals will be constructed for each downgradient well and used to compare Appendix IV groundwater monitoring data to groundwater protection standards. The statistical analysis will be conducted in accordance with the USEPA March 2009 Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.

A site-specific statistical analysis plan that provides details regarding the statistical methods to be used will be placed in the site's operating record pursuant to 391-3-4-.10(6). An overview of the statistical analysis plan is provided in the following figures presented in **Appendix D**.

- Figure D1, Statistical Analysis Plan Overview, includes a flowchart that depicts the process that will be followed to develop the site-specific plan.
- Figure D2, Decision Logic for Computing Prediction Limits, presents the logic that will be used to calculate site-specific statistical limits and test compliance results against those limits.

Appendix A. **Groundwater Monitoring Network Documentation**

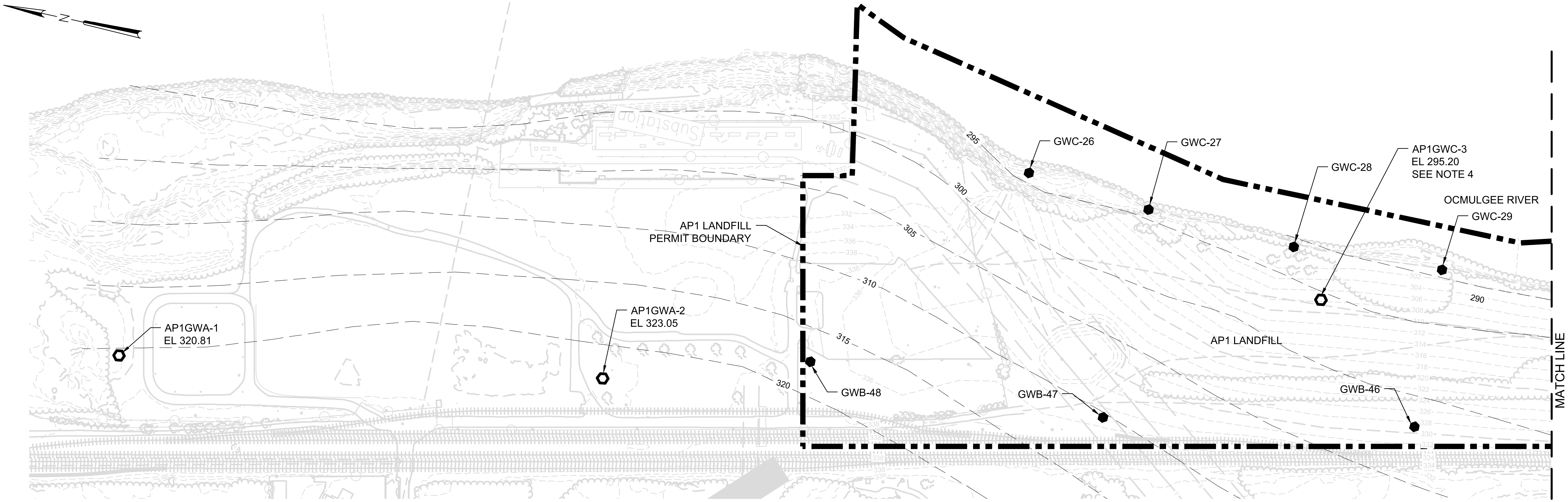
Figure 1. Site Monitoring Plan

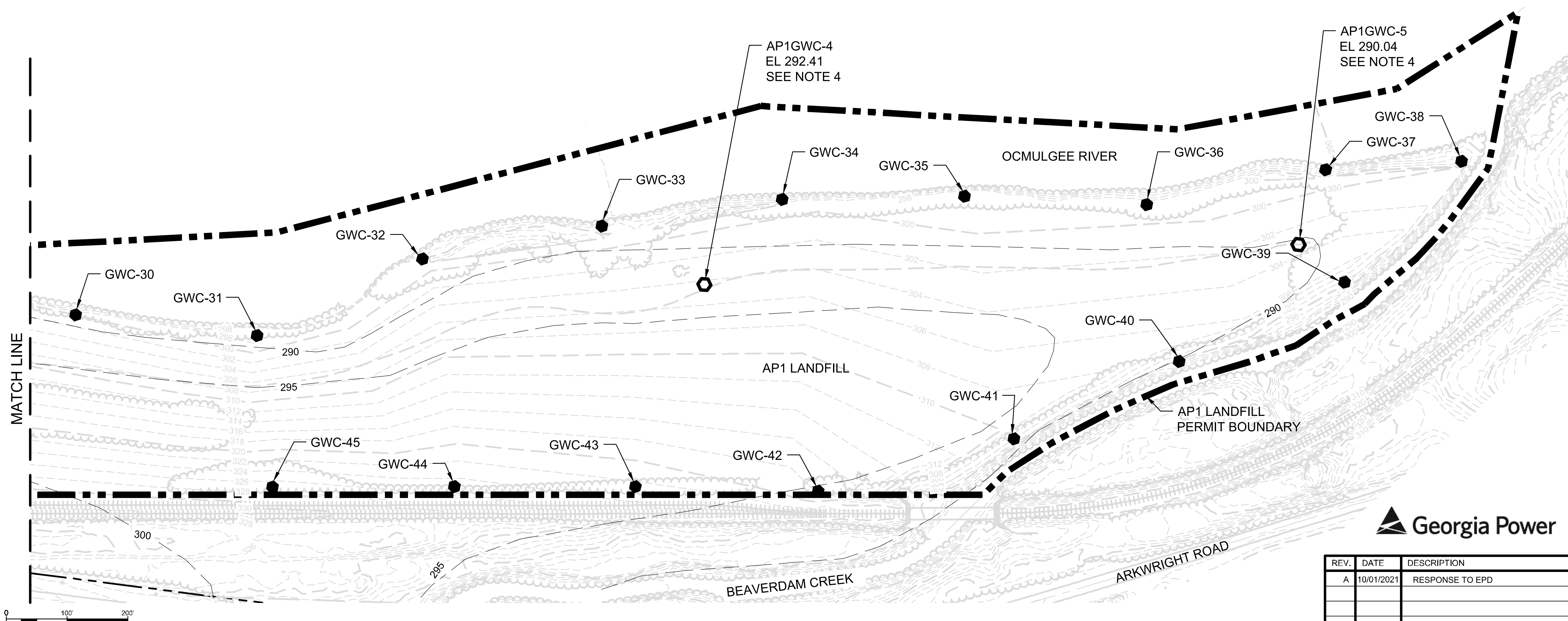
Figure 2. July 13, 2021 Potentiometric Surface Map

Table A1. Monitoring Well Details

Table A2. Groundwater Flow Rate Calculation

Water Well Drillers Bonds





NOTES:

1. EXISTING CONTOURS SHOWN REPRESENT ANTICIPATED CONDITIONS AFTER FINAL GRADING HAS BEEN COMPLETED.
2. FOR LEGEND SEE DRAWING C-002.
3. POTENTIOMETRIC CONTOURS BASED ON WATER LEVEL MEASUREMENTS TAKEN ON 09-11-2018.
4. GROUNDWATER MONITORING WELLS AP1GWC-3, AP1GWC-4, AND AP1GWC-5 WERE PREVIOUSLY ABANDONED.

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FIGURE 1

SITE MONITORING PLAN

AP1 LANDFILL

FOR

GEORGIA POWER COMPANY
FORMER PLANT ARKWRIGHT

MACON - BIBB COUNTY, GA

Georgia Power

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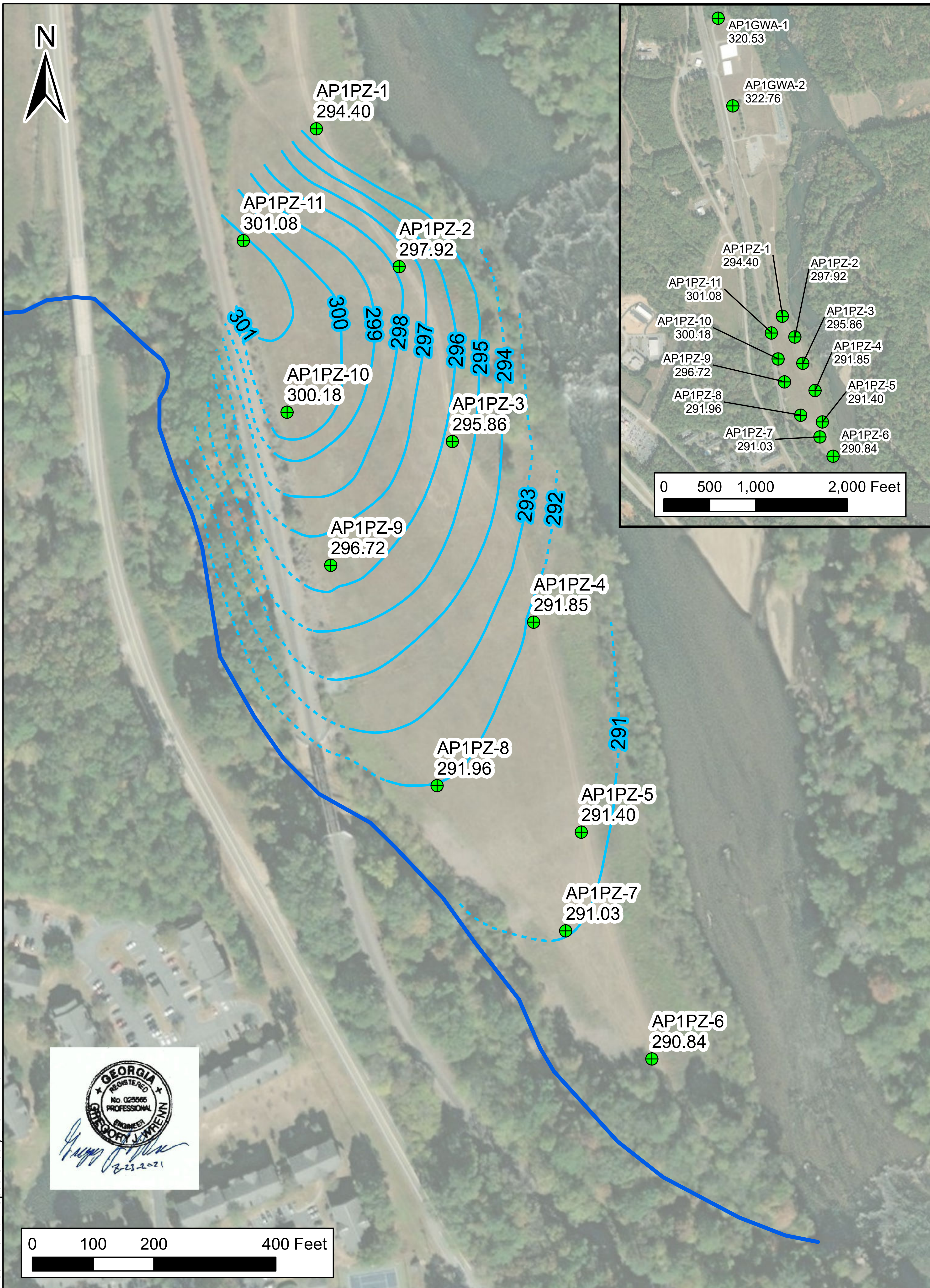
404.978.7600
JACOBS.COM

Ten 10th Street NW, Suite 1400, Atlanta, GA 30309

REV.	DATE	DESCRIPTION
A	10/01/2021	RESPONSE TO EPD

PROJ. NO.	D3442700	DWG. CS101	EDIT
SCALE	AS SHOWN	SHEET 13 OF 15	
DATE	OCTOBER 2021		



Legend

291.03 Groundwater Elevation (ft NAVD88)

Piezometer Location

Groundwater Contour (ft NAVD88)

Inferred Groundwater Contour (ft NAVD88)

Beaverdam Creek

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Plant Arkwright AP1 Landfill
Macon, Georgia

July 13, 2021 Potentiometric Surface Map

Prepared By-Date: NJM - 8/23/2021	wood.	**Figure: 2**
Checked By-Date: RQ - 8/23/2021		
Project Number: 6123211714		

Document Path: Z:\Arkwright\1_MXDs\AP1\Pot_Maps\13_July_2021.mxd

Table A1. Monitoring Well Details

Monitoring Well ID	Northing	Easting	Ground Elevation (ft MSL)	TOC Elevation (ft MSL)	Well Depth (ft BTOC)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation (ft MSL)	GW Elevation (ft MSL)	Average Hydraulic Conductivity (cm/s)	Groundwater Zone Screened
AP1GWA-1	1066048.91	2439462.98	342.28	345.44	37.16	318.6	308.6	320.53	3.08E-03	Overburden/ Bedrock
AP1GWA-2	1065095.10	2439623.37	338.55	341.42	30.87	320.9	310.9	322.76	5.11E-03	Overburden/ Bedrock
AP1-PZ1	1062799.79	2440164.34	335.92	338.97	87.62	261.9	251.9	294.40	--	Overburden/ Bedrock
AP1-PZ2	1062573.21	2440300.14	336.64	339.58	62.67	287.5	277.5	297.92	8.59E-04	Bedrock
AP1-PZ3	1062286.28	2440387.36	335.50	338.57	67.44	281.7	271.7	295.86	--	Overburden/ Bedrock
AP1-PZ4	1061989.86	2440520.65	334.98	338.36	67.42	281.4	271.4	291.85	4.08E-05	Overburden
AP1-PZ5	1061645.61	2440599.18	336.61	339.81	67.25	283.1	273.1	291.40	9.42E-05	Overburden
AP1-PZ6	1061273.40	2440714.78	344.25	347.56	72.70	285.4	275.4	290.84	2.99E-04	Overburden/ PWR
AP1-PZ7	1061483.62	2440573.47	337.56	340.91	77.75	273.7	263.7	291.03	--	Overburden
AP1-PZ8	1061721.72	2440362.39	334.94	338.31	66.09	282.7	272.7	291.96	4.01E-05	Overburden/ PWR
AP1-PZ9	1062083.33	2440187.59	334.14	337.62	57.35	291.4	281.4	296.72	2.37E-06	Bedrock
AP1-PZ10	1062334.74	2440116.05	335.07	338.38	56.48	292.4	282.4	300.18	1.58E-05	Bedrock
AP1-PZ11	1062615.94	2440044.48	335.78	338.98	73.30	276.2	266.2	301.08	4.24E-04	Overburden

Notes:

1. Groundwater levels were measured on July 13, 2021.
2. TOC = top of casing (i.e., riser pipe).
3. All depths measured in feet below top of casing (BTOC).
4. Elevations measured in feet from mean sea level (MSL). NGVD 1929 (AP1GWA-1 and AP1GWA-2) and NAVD 88 (AP1-PZ1 through AP1-PZ11).
5. Coordinates are in Georgia West State Plane, US Survey Feet, NAD 83.
6. Hydraulic conductivities are the average of a slug-in and slug-out tests. Dashes indicate no slug test performed. AP1GWA-1 and AP1GWA-2 slug tests were performed by Atlantic Coast Consulting. AP1PZ-1 through AP1PZ-11 slug tests were performed by Wood.

Table A2
Groundwater Flow Rate Calculation
Former Plant Arkwright - AP1 Landfill
July 13, 2021 Gauging Event

Equation

$$v = \frac{k\ (dh/dL)}{P_e}$$

where: v = groundwater flow velocity
k = hydraulic conductivity
dh/dL = hydraulic gradient
P_e = effective porosity

Calculation: Velocity between AP1PZ-11 and AP1PZ-1

k =	1.2E+00	ft/day	k value for AP1PZ-11 from Table A1
dh/dL =	0.031	unitless	Well AP1PZ-11 to AP1PZ-1 (218 feet)
P_e =	25%	unitless	Reference 1 (silty sand)

v = (1.2E-00 * 0.031) / (0.25)

v = 1.5E-01 ft/day

v = 53.8 ft/yr

Calculation: Velocity between AP1PZ-9 and AP1PZ-8

k =	6.0E-02	ft/day	Average k value for AP1PZ-8 and AP1PZ-9 from Table A1
dh/dL =	0.012	unitless	Well AP1PZ-9 to AP1PZ-8 (400 feet)
P_e =	25%	unitless	Reference 1 (silty sand)

v = (6.0E-02 * 0.012) / (0.25)

v = 2.9E-03 ft/day

v = 1.0 ft/yr

References:

1) Freeze and Cherry, Groundwater, Prentice-Hall, Inc., 1979.

SURETY RIDER

To be attached to and form a part of

Bond No. 800031223

Type of
Bond: Performance Bond for Water Well Contractors

dated
effective June 30, 2017
(MONTH-DAY-YEAR)

executed by Michael C. Rice/Cascade Drilling, L.P. , as Principal,
(PRINCIPAL)

and by Atlantic Specialty Insurance Company , as Surety,

in favor of State of Georgia
(OBLIGEE)

in consideration of the mutual agreements herein contained the Principal and the Surety hereby consent to changing

Coverage under the bond to include:
Michael Coleman

Nothing herein contained shall vary, alter or extend any provision or condition of this bond except as herein expressly stated.

This rider
is effective December 21, 2017
(MONTH-DAY-YEAR)

Signed and Sealed December 21, 2017
(MONTH-DAY-YEAR)

Michael C. Rice/Cascade Drilling, L.P.
(PRINCIPAL)

By: ______________________
(PRINCIPAL)

Atlantic Specialty Insurance Company

By: [signature]
Elizabeth R. Hahn, Attorney-in-Fact

SPECIALTY INSURANCE COMPANY CORPORATE SEAL 1986 NEW YORK ATLANTIC

S-0443/GE 8/08

XDP

OneBeacon
INSURANCE GROUP

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS, that ATLANTIC SPECIALTY INSURANCE COMPANY, a New York corporation with its principal office in Plymouth, Minnesota, does hereby constitute and appoint: **Deanna M. French, Jill A. Wallace, Susan B. Larson, Elizabeth R. Hahn, Jana M. Roy, Scott McGilvray, Mindee L. Rankin, Ronald J. Lange, John R. Claeys, Roger Kaltenbach, Guy Armfield, Scott Fisher**, each individually if there be more than one named, its true and lawful Attorney-in-Fact, to make, execute, seal and deliver, for and on its behalf as surety, any and all bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof; provided that no bond or undertaking executed under this authority shall exceed in amount the sum of: **sixty million dollars ($60,000,000)** and the execution of such bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof in pursuance of these presents, shall be as binding upon said Company as if they had been fully signed by an authorized officer of the Company and sealed with the Company seal. This Power of Attorney is made and executed by authority of the following resolutions adopted by the Board of Directors of ATLANTIC SPECIALTY INSURANCE COMPANY on the twenty-fifth day of September, 2012:

> Resolved: That the President, any Senior Vice President or Vice-President (each an "Authorized Officer") may execute for and in behalf of the Company any and all bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof, and affix the seal of the Company thereto; and that the Authorized Officer may appoint and authorize an Attorney-in-Fact to execute on behalf of the Company any and all such instruments and to affix the Company seal thereto; and that the Authorized Officer may at any time remove any such Attorney-in-Fact and revoke all power and authority given to any such Attorney-in-Fact.
>
> Resolved: That the Attorney-in-Fact may be given full power and authority to execute for and in the name and on behalf of the Company any and all bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof, and any such instrument executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed and sealed by an Authorized Officer and, further, the Attorney-in-Fact is hereby authorized to verify any affidavit required to be attached to bonds, recognizances, contracts of indemnity, and all other writings obligatory in the nature thereof.

This power of attorney is signed and sealed by facsimile under the authority of the following Resolution adopted by the Board of Directors of ATLANTIC SPECIALTY INSURANCE COMPANY on the twenty-fifth day of September, 2012:

> Resolved: That the signature of an Authorized Officer, the signature of the Secretary or the Assistant Secretary, and the Company seal may be affixed by facsimile to any power of attorney or to any certificate relating thereto appointing an Attorney-in-Fact for purposes only of executing and sealing any bond, undertaking, recognizance or other written obligation in the nature thereof, and any such signature and seal where so used, being hereby adopted by the Company as the original signature of such officer and the original seal of the Company, to be valid and binding upon the Company with the same force and effect as though manually affixed.

IN WITNESS WHEREOF, ATLANTIC SPECIALTY INSURANCE COMPANY has caused these presents to be signed by an Authorized Officer and the seal of the Company to be affixed this eighth day of December, 2014.

ATLANTIC SPECIALTY INSURANCE COMPANY CORPORATE SEAL 1986 NEW YORK

By Paul J. Brehm
Paul J. Brehm, Senior Vice President

STATE OF MINNESOTA
HENNEPIN COUNTY

On this eighth day of December, 2014, before me personally came Paul J. Brehm, Senior Vice President of ATLANTIC SPECIALTY INSURANCE COMPANY, to me personally known to be the individual and officer described in and who executed the preceding instrument, and he acknowledged the execution of the same, and being by me duly sworn, that he is the said officer of the Company aforesaid, and that the seal affixed to the preceding instrument is the seal of said Company and that the said seal and the signature as such officer was duly affixed and subscribed to the said instrument by the authority and at the direction of the Company.

TARA JANELLE STAFFORD
NOTARY PUBLIC - MINNESOTA
My Commission Expires
January 31, 2020

Tara Stafford
Notary Public

I, the undersigned, Assistant Secretary of ATLANTIC SPECIALTY INSURANCE COMPANY, a New York Corporation, do hereby certify that the foregoing power of attorney is in full force and has not been revoked, and the resolutions set forth above are now in force.

Signed and sealed. Dated 21 day of December, 2017

ATLANTIC SPECIALTY INSURANCE COMPANY CORPORATE SEAL 1986 NEW YORK

James G. Jordan
James G. Jordan, Assistant Secretary

This Power of Attorney expires October 1, 2019

CONTINUATION
CERTIFICATE

Atlantic Specialty Insurance Company , Surety upon

a certain Bond No. 800033976

Issued on 9/27/2017
Expires on 6/30/2019
Renewed on 3/4/2019
Expires on 6/30/2021

dated effective 09/27/2017
(MONTH-DAY-YEAR)

on behalf of Ricky Davis / Cascade Drilling, L.P.
(PRINCIPAL)

and in favor of Department of Natural Resources, State of Georgia
(OBLIGEE)

does hereby continue said bond in force for the further period

beginning on 06/30/2019
(MONTH-DAY-YEAR)

and ending on 06/30/2021
(MONTH-DAY-YEAR)

Amount of bond Thirty Thousand and 00/100 Dollars ($30,000.00)

Description of bond Performance Bond for Water Well Contractors

Premium: $1200.00

PROVIDED: **That this continuation certificate does not create a new obligation and is executed upon the express condition and provision that the Surety's liability under said bond and this and all Continuation Certificates issued in connection therewith shall not be cumulative and that the said Surety's aggregate liability under said bond and this and all such Continuation Certificates on account of all defaults committed during the period (regardless of the number of years) said bond had been and shall be in force, shall not in any event exceed the amount of said bond as hereinbefore set forth.**

Signed and dated on March 4th, 2019
(MONTH-DAY-YEAR)

Atlantic Specialty Insurance Company

By Andrew P. Larsen
Attorney-in-Fact Andrew P. Larsen

Parker, Smith & Feek, Inc.
Agent

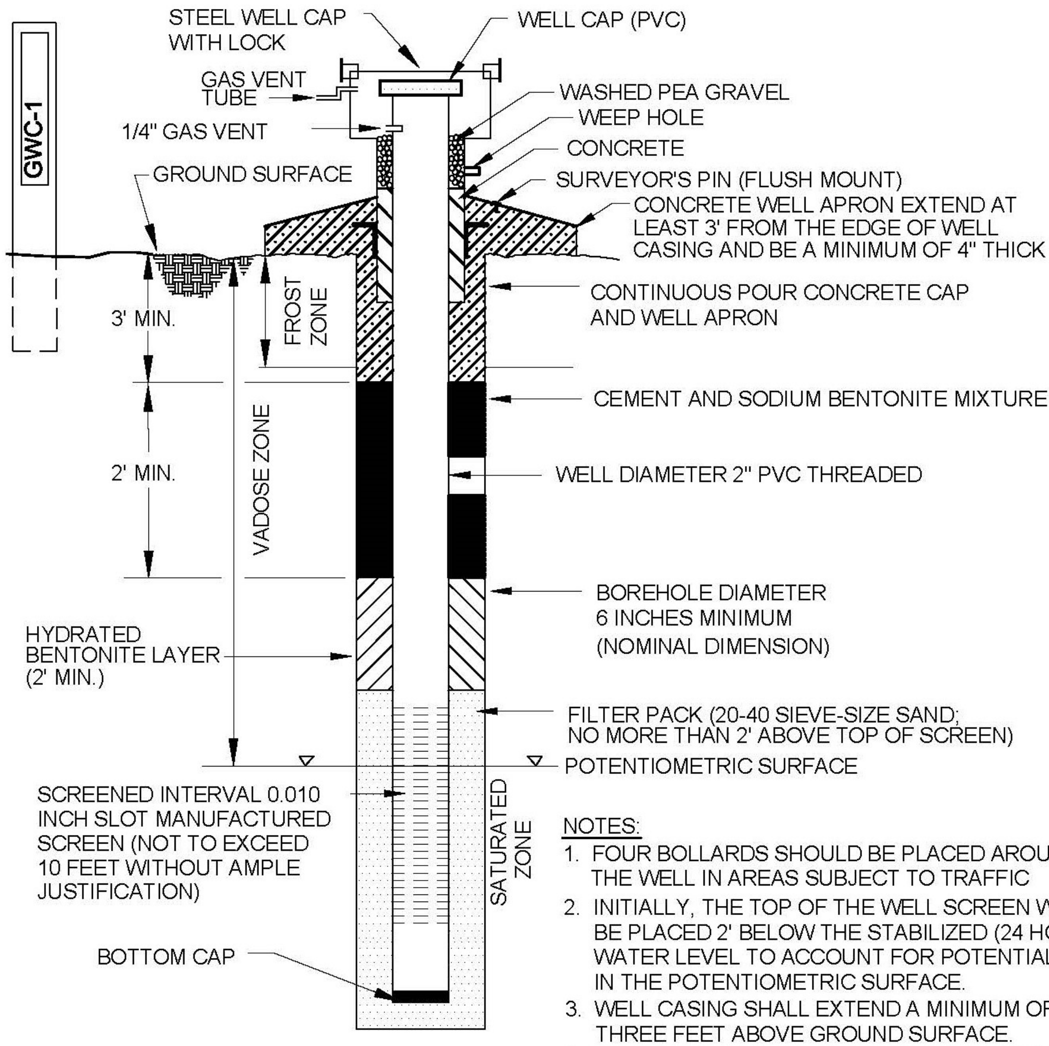
2233 112th Ave NE Bellevue, WA 98004
Address of Agent

425-709-3600
Telephone Number of Agent

S-0157/GE 8/08

XDP

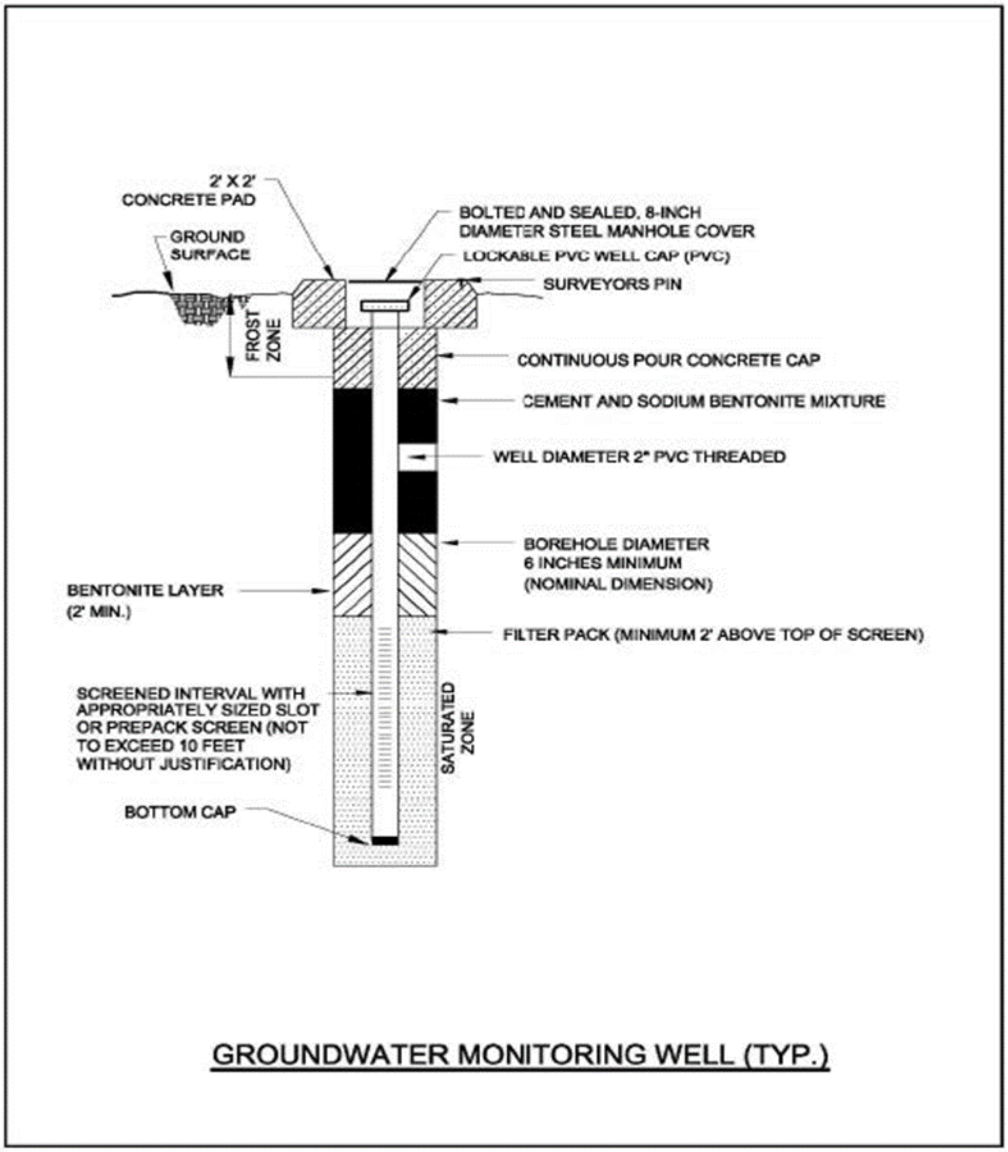
Appendix B. **Groundwater Well Details**



NOTES:

1. FOUR BOLLARDS SHOULD BE PLACED AROUND THE WELL IN AREAS SUBJECT TO TRAFFIC
2. INITIALLY, THE TOP OF THE WELL SCREEN WILL BE PLACED 2' BELOW THE STABILIZED (24 HOUR) WATER LEVEL TO ACCOUNT FOR POTENTIAL DROP IN THE POTENTIOMETRIC SURFACE.
3. WELL CASING SHALL EXTEND A MINIMUM OF THREE FEET ABOVE GROUND SURFACE.
4. CONCRETE WELL APRON WILL SLOPE AWAY FROM THE WELL, EXTEND AT LEAST 3' FROM THE EDGE OF THE WELL CASING AND MUST BE A MINIMUM OF 4" THICK.
5. ALL PVC UTILIZED IN THE CONSTRUCTION OF THE GROUNDWATER MONITORING WELLS (BOTTOM CAP, SCREEN AND RISER) IS REQUIRED TO BE ASTM NSF RATED.

GROUNDWATER MONITORING WELL (TYP.)


2' X 2'
CONCRETE PAD
GROUND
SURFACE
FROST
ZONE
BOLTED AND SEALED, 8-INCH
DIAMETER STEEL MANHOLE COVER
LOCKABLE PVC WELL CAP (PVC)
SURVEYORS PIN
CONTINUOUS POUR CONCRETE CAP
CEMENT AND SODIUM BENTONITE MIXTURE
WELL DIAMETER 2" PVC THREADED
BOREHOLE DIAMETER
6 INCHES MINIMUM
(NOMINAL DIMENSION)
BENTONITE LAYER
(2' MIN.)
FILTER PACK (MINIMUM 2' ABOVE TOP OF SCREEN)
SCREENED INTERVAL WITH
APPROPRIATELY SIZED SLOT
OR PREPACK SCREEN (NOT
TO EXCEED 10 FEET
WITHOUT JUSTIFICATION)
SATURATED
ZONE
BOTTOM CAP
GROUNDWATER MONITORING WELL (TYP.)

Appendix C. **Groundwater Sampling Procedure**

GROUNDWATER SAMPLING PROCEDURE

Groundwater sampling will be conducted using USEPA Region 4 Field Quality and Technical Procedures as a guide. The following procedures describe the general methods associated with groundwater sampling at the site. Prior to sampling, the well must be evacuated (purged) to ensure that representative groundwater is obtained. Any item coming in contact with the inside of the well casing or the well water will be kept in a clean container and handled only with gloved hands.

GPC will follow the procedures below at each well to ensure that a representative sample is collected:

1) Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations and notify GPC if it appears that the well has been compromised.
2) Measure and record the depth to water in all wells to be sampled prior to purging using a water measuring device consisting of probe and measuring tape capable of measuring water levels with accuracy to 0.01 foot. Static water levels will be measured from each well, within a 24-hour period. The water level measuring device will be decontaminated prior to lowering in each well.
3) Measure Water Level: Immediately prior to purging, measure the water level again with the pump in the well. Leave the water level measuring device in the well.
4) Install Pump: If a dedicated pump is not present, slowly lower the pump into the well to the midpoint of the well screen or a depth otherwise approved by the hydrogeologist or project scientist. The pump intake must be kept at least two (2) feet above the bottom of the well to prevent disturbance and suspension of any sediment present in the bottom of the well. Record the depth to which the pump is lowered. All non-dedicated pumps and wiring will be decontaminated before use and between well locations using procedures described in the latest version of the Region 4 USEPA Science and Ecosystem Support Division (SESD) Operating Procedure for Field Equipment Cleaning and Decontamination as a guide.
5) Purge Well: Begin pumping the well at approximately 100 to 500 milliliters per minute (mL/min). Monitor the water level continually. Maintain a steady flow rate that results in a stabilized water level with 0.3 ft. or less of variability. Avoid entraining air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.
6) Monitor Indicator Parameters: Monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, oxidation reduction potential (ORP), and dissolved oxygen (DO)) approximately every three to five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings at a minimum:
   - ±0.1 for pH
   - ±5% for specific conductance (conductivity)
   - ±10% or 0.2 mg/L (whichever is greater) for DO where DO>0.5mg/L. If DO<0.5mg/L no stabilization criteria
   - ≤5 NTU for turbidity
   - Temperature – Record only, not used for stabilization criteria
   - ORP – Record only, not used for stabilization criteria
7) Collect samples at a low flow rate and such that drawdown of the water level within the well is stable. Flow rate must be reduced if excessive drawdown is observed during sampling. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container.

8) Compliance samples will be unfiltered; however, to determine if turbidity is affecting sample results, duplicate samples may be filtered in the field prior to being placed in a sample container, clearly marked as filtered and preserved. Filtering will be accomplished by the use of 0.45 micron filters on the sampling line. At least two filter volumes of sample will pass through before filling sample containers. Filtered samples are not considered compliance samples and are only used to evaluate the effects of turbidity.
9) All sample bottles will be filled, capped, and placed in an ice containing cooler immediately after sampling where temperature control is required. Samples that do not require temperature control will be placed in a clean and secure container.
10) Sample containers and preservative will be appropriate for the analytical method being used.
11) Information contained on sample container labels will include:
    a) Name of facility
    b) Date and time of sampling
    c) Sample description (well number)
    d) Sampler's initials
    e) Preservatives
    f) Analytical method(s)
12) After samples are collected, samplers will remove all non-dedicated equipment. Upon completion of all activity the well will be closed and locked.
13) Samples will be delivered to the laboratory following appropriate COC and temperature control requirements. The goal for sample delivery will be within 48 hours of collection.

Throughout the sampling process, new latex or nitrile gloves will be worn by the sampling personnel. A clean pair of new, disposable gloves will be worn each time a different location is sampled and new gloves donned prior to filling sample bottles. Gloves will be discarded after sampling each well and before sampling the next well.

The goal when sampling is to attain a turbidity of less than 5 NTU; however, samples may be collected where turbidity is less than 10 NTU and the stabilization criteria described above are met.

If sample turbidity is greater than 5 NTU and all other stabilization criteria have been met, samplers will continue purging for 3 additional hours in order to reduce the turbidity to 5 NTU or less.

- If turbidity remains above 5 NTU but is less than 10 NTU, and all other parameters are stabilized, the well can be sampled.

- Where turbidity remains above 10 NTU, an unfiltered sample will be collected followed by a filtered sample that has passed through an in-line 0.45-micron filter attached to the discharge (sample collection) tube. Data from filtered samples will only be used to quantify the effects of turbidity on sample results.

Samplers will identify the sample bottle as containing a filtered sample on the sample bottle label and on COC form.

A brief overview of purging and sampling methodologies, including the type of sampling equipment used will be provided in routine monitoring reports.

Appendix D. **Statistical Analysis Overview**

Figure D1 – Statistical Analysis Plan Overview

Figure D2 – Decision Logic for Computing Prediction Limits

Figure D1 – Statistical Analysis Plan Overview

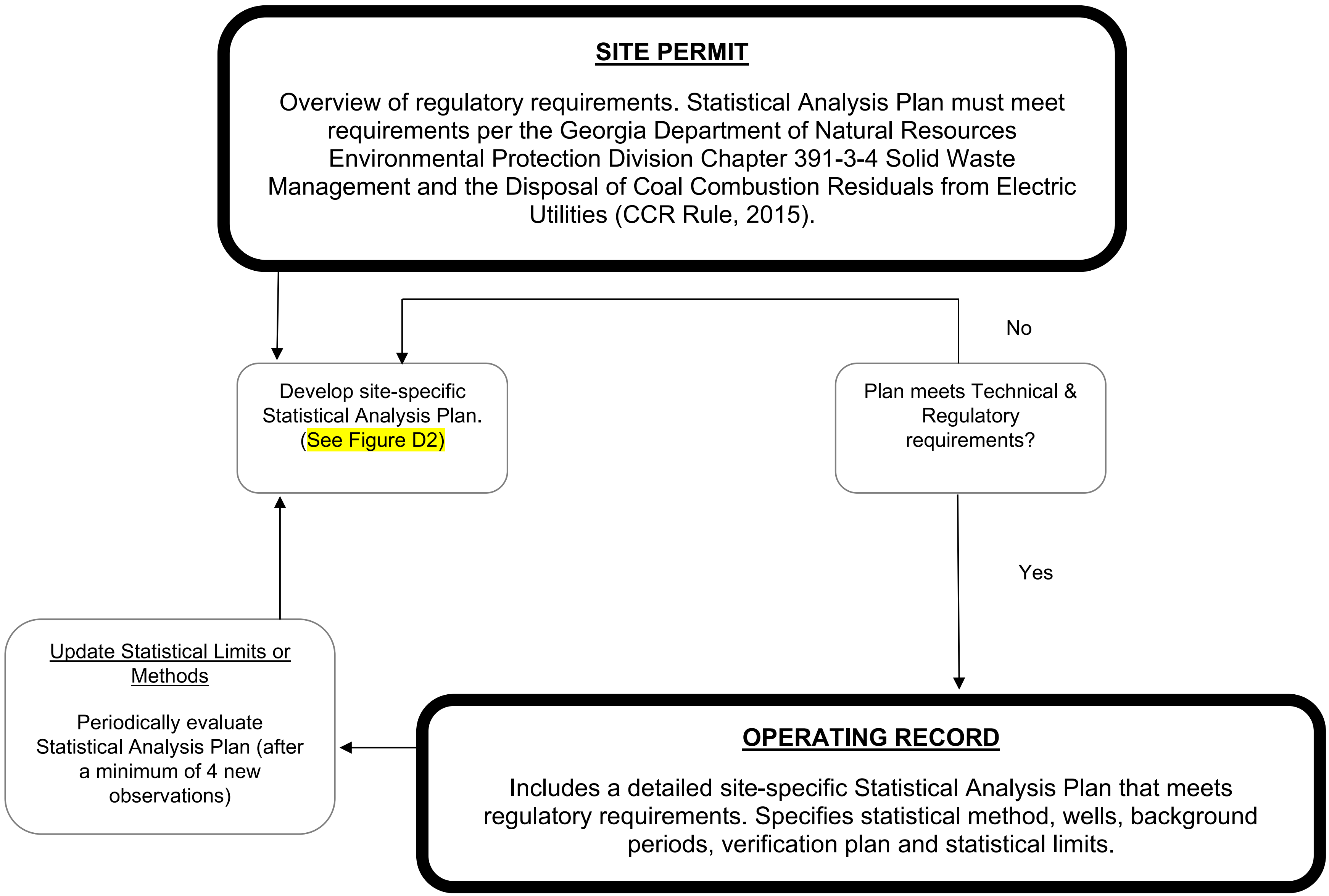


Figure D2 – Decision Logic for Computing Prediction Limits