SCS ENGINEERS

GROUNDWATER SAMPLING AND ANALYSIS PLAN

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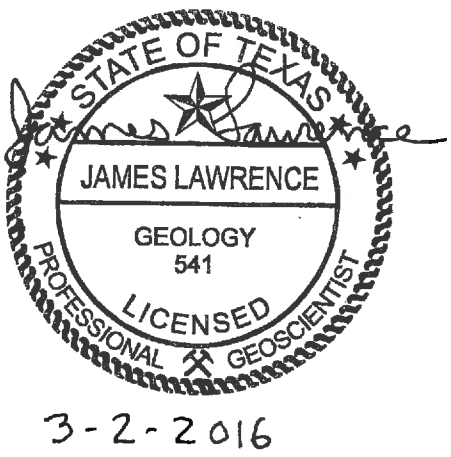

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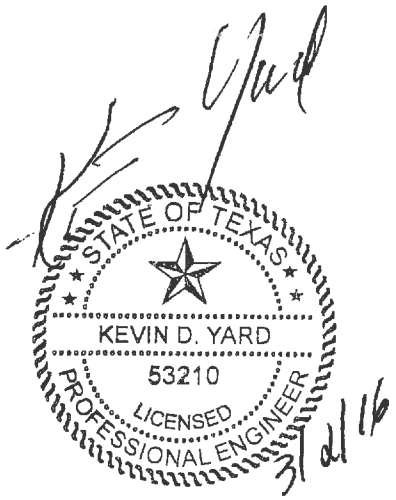

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1.0 INTRODUCTION

This Groundwater Sampling and Analysis Plan (GWSAP) has been prepared for the Coal Combustion Residuals (CCR) Landfill at the Sandy Creek Energy Station in Riesel, Texas, consistent with 40 CFR 257.93. The following sampling procedures are designed to aid in obtaining representative groundwater samples at each groundwater monitoring well. These or equivalent procedures are to be followed by all personnel conducting groundwater monitoring well sampling.

2.0 GROUNDWATER SAMPLING PROCEDURES

The following sampling procedures are designed to aid in obtaining representative groundwater samples at each well. These or equivalent procedures are to be followed by all personnel conducting groundwater monitoring well sampling.

2.1 FIELD SETUP

Examine the well area for anything unusual such as damage to the well head, spilled materials, etc., and record all observations in the field log.

- Is the well number clearly labeled on outer casing or lid?
- Is the protective casing intact and not bent or excessively corroded?
- Is the concrete pad intact (no evidence of cracking or erosional undercutting)?
- Is the padlock functional?
- Is the inner casing intact?
- Is the inner casing properly capped?

Sampling equipment will include a calibrated container for measuring bailed or purged well fluids and a small glass container for measuring temperature, specific conductance, and pH.

Field instruments for measuring pH and specific conductance will be calibrated following manufacturer's instructions prior to the sampling event.

Decontamination equipment will include suitable materials such as spray bottles with appropriate phosphate-free detergent and/or clean water, brush, and additional rinse water bottles as needed.

2.2 MEASUREMENT OF GROUNDWATER ELEVATIONS

Prior to purging each monitoring well, measure the depth to groundwater and record the measurement in the field notes in accordance with 257.93(c). Decontaminate the water-level measuring device between wells. Water levels are to be measured and reported to the nearest hundredth of a foot. Water level measurements will be collected from the highest water elevation to the lowest water elevation wells (based on previous event results) unless non-naturally occurring impacts are confirmed in any well(s). If non-naturally occurring impacts are confirmed, then water level measurements will be collected from the least to most impacted well.

2.3 WELL PURGING

Purging and sampling will be conducted using conventional purge and sampling. The order of well purging will be from the highest water elevation to the lowest water elevation wells (based on water level measurements obtained immediately prior to the event), unless non-naturally occurring impacts are confirmed. In the event that non-naturally occurring impacts are confirmed, purging will be conducted from the least-impacted to the most impacted well. Each

monitoring well will be purged immediately prior to sample collection with a dedicated PVC bailer. Purging will remove stagnant water in the well casing and allow formation water to enter the well for sampling. Purged water from the monitoring wells will be discharged into drums. Each well will be purged until three well volumes are removed or until dry, followed by sampling within 72 hours when possible. The volume of water to be purged will be calculated as follows:

> The depth of water in the well column is calculated by subtracting the depth to the water surface from the total depth of the well casing. The volume per foot of 2-inch diameter, schedule 40 PVC well casing is 0.163 gallons. The amount of water present in the well casing can be calculated by multiplying the depth of water by the value above for the proper casing diameter. Multiply the amount of water in the casing by three to obtain the amount of water in three well volumes to be purged.

Example:

Total depth of well casing (feet)	20.00
Depth to groundwater (feet)	- 9.50
Depth of water column (feet)	10.50
Gallons per foot of 2-inch casing	x 0.163
Amount of water in casing (gallons)	1.71
Three well volumes	x 3
Total volume to be purged (gallons)	5.13

During the purging operations, a field log or its equivalent, will be maintained that will record the weather conditions, condition of the wells and other noteworthy observations which may include condition of surrounding ground surface, water turbidity, color, odor, water level, and depth of well. The information will be recorded in ink in the field log.

Water purged from each well, along with unused water obtained during sampling and water used for decontamination, is to be collected and disposed as follows: purge and decontamination water will be collected in drums and stored onsite for subsequent disposal either (1) on-site or (2) as approved by a Professional Geologist licensed in the State of Texas. Analytical data will be reviewed prior to disposal of the water.

2.4 SAMPLE COLLECTION

Groundwater samples will be collected with a disposable PVC bailer utilizing a bottom emptying device to reduce aeration and turbulence. A new disposable bailer will be used for each well. All samples will be placed directly into the appropriate sample vessel without the use of transfer containers, taking care not to allow the sampling device to touch the sample container. Samples will not be filtered in accordance with 257.93(h)(2)(i). Plastic gloves will be worn during all sample collection procedures. Soiled equipment such as sample bottles, gloves, bailers or bottom emptying devices will not be reused until decontaminated. Water removed during sampling that is not placed in sample bottles will be handled in a manner similar for purged water. The area around the sampling point will be checked for possible sources of air contamination. Sampling

will proceed from the well with the highest groundwater elevation to those with successively lower elevations. If non-naturally occurring impacts are confirmed, monitoring wells not likely to be impacted will be sampled before those that are known or suspected to be impacted.

2.5 SAMPLE CONTAINERS AND LABELS

Water samples collected in the field are to be placed into laboratory-cleaned bottles of the appropriate size and construction for the chemical constituents to be analyzed. Sample containers will be marked as described below.

Sample labels will be affixed to each sample container and will contain the following information in waterproof ink:

- Project name (includes site name)
- Sample and well number
- Date and time of sample collection
- Special handling instructions

QA/QC samples will be labeled accordingly. Duplicate samples will be labeled in a manner to prevent the lab from knowing which well the duplicate came from.

2.6 SAMPLE PRESERVATION AND SHIPMENT

No samples will be filtered in the field before shipping in accordance with 257.93(h)(2)(i). Filtering is allowed by the laboratory only if required to protect sensitive analytical equipment.

Samples to be shipped will be packed in a hard-sided insulated shipping container pre-cooled with water ice. The sample containers will be packed to prevent breakage. Discard the water ice used to pre-cool the shipping container and add adequate water ice to maintain the temperature at about 4°C during shipment. Only water ice may be used for chilling.

2.7 QUALITY ASSURANCE AND QUALITY CONTROL

To document that sample collection and handling procedures used in the field have not affected the quality of groundwater samples, blanks are to be prepared and analyzed. These blanks consist of one duplicate sample per sampling event. Equipment blanks will not be required due to the use of disposable equipment. Field blanks will not be required because no volatile constituents will be analyzed.

Duplicate samples will be analyzed for the detection monitoring constituents listed in Table 1.

2.8 CHAIN-OF-CUSTODY DOCUMENTATION

A chain-of-custody (COC) form will be maintained in order to track possession and handling of samples from field collection through laboratory testing in accordance with 257.93(a)(4). COC

records show the custody of samples at all times. Samples are in the custody of an individual when they are either in the individual's sight or securely under the individual's control.

COC documentation is maintained on a chain-of-custody record form. Each sample will be logged onto the COC record form as it is collected. Information on the COC record form typically includes the following, as appropriate:

- Project name (includes site name)
- Site location
- Sample number
- Sample date and time
- Sample type
- Number and type of sample containers
- Analyses required
- Sample preservative
- Lab destination
- Carrier/shipping number
- Special instructions
- Spaces for signatures of sampler(s) and everyone assuming sample custody

The COC record will contain the signatures of anyone assuming custody of the samples. Each time custody changes hands, the party releasing the samples signs under "Relinquished By" and records the date and time. The party receiving the samples signs under the heading "Received By" and records the date and time. The COC form is typically provided by the analytical laboratory. When the sample container(s) are relinquished for shipping, the shipping paperwork constitutes the COC for that period when the sample(s) are in the custody of the shipper.

2.9 EQUIPMENT DECONTAMINATION

Reusable sampling equipment and measurement instruments coming in contact with the groundwater in wells or in samples are to be decontaminated before use at each well location.

The following decontamination standards or equivalent procedures are to be followed for well purging and sampling equipment. Wash the equipment with a nonphosphate detergent and rinse with deionized water. Waste decontamination water and cleaning agents are to be placed in the drums adjacent to each well that are used to contain well purge water.

2.10 FIELD DOCUMENTATION

Field activities will be thoroughly documented in the field log, forms, or equivalent. Below is an outline of the information that is documented during field activities, as appropriate for the conditions.

- Project name
- Date and time of all activities
- Sampling personnel
- Field instrument calibration methods and remarks
- Well identification number
- Well description, including casing size
- Description of well condition
- Initial water-level measurement with point of reference (top of casing) and time of measurement
- Well volume calculations
- Presence and thicknesses of immiscible layers, if present
- Physical description of groundwater (color, odor, turbidity)
- Temperature, conductivity, and pH measurements
- Sample time, date and description
- Samples collected (number of bottles)

3.0 LABORATORY QUALITY ASSURANCE AND QUALITY CONTROL

All analytical data submitted will be examined to ensure that the data quality objectives are considered and met prior to submittal. The quality control results, supporting data, and data review by the laboratory will be included. Any potential impacts will be reported such as the bias on the quality of the data, footnotes in the report, and anything of concern that was identified in the laboratory case narrative summary.

The laboratory will document and report all problems and observed anomalies associated with the analysis. If analysis of the data indicates that the data fails to meet the quality control goals for the laboratory's analytical data analysis program, Sandy Creek Energy Station management in consultation with the laboratory and consultant will determine if the data is usable. If the evaluation determines the analytical data may be utilized, any and all problems and corrective action that the laboratory identified during the analysis will be included in the report.

A Laboratory Case Narrative (LCN) report for all problems and anomalies observed will be included with the report. The LCN will report the following information:

1. The exact number of samples, testing parameters and sample matrix.
2. The name of the laboratory involved in the analysis. If more than one laboratory is used, all laboratories will be identified in the case narrative.
3. The test objective regarding samples.
4. Explanation of each failed precision and accuracy measurement determined to be outside of the laboratory and/or method control limits.
5. Explanation if the effect of the failed precision and accuracy measurements on the results induces a positive or negative bias.
6. Identification and explanation of problems associated with the sample results, along with the limitations these problems have on data usability.
7. A statement on the estimated uncertainty of analytical results of the samples when appropriate and/or requested.
8. A statement of compliance and/or noncompliance with the requirements and specifications. Exceedance of holding times and identification of matrix interferences will be identified. Dilutions will be identified and if dilutions are necessary, they will be done to the smallest dilution possible to effectively minimize matrix interferences and bring the sample into control for analysis.
9. Identification of any and all applicable quality assurance and quality control samples that will require special attention by the reviewer.
10. A statement on the quality control of the analytical method of the permit and the analytical recoveries information will be provided when appropriate and/or when requested.

In addition to the LCN, the following information will be submitted for all analytical data:

1. A table identifying the field sample name with the sample identification in the laboratory report.
2. Chain of custody.
3. An analytical report that documents the results and methods for each sample and analyte to be included for every analytical testing event. These test reports will document the reporting limit/method detection limit the laboratory used.

4.0 GROUNDWATER MONITORING REQUIREMENTS

Groundwater monitoring is to follow the requirements for detection, assessment, and corrective action monitoring as outlined in applicable parts of 40 CFR 257.93 - .98

4.1 DETECTION MONITORING PARAMETERS AND ANALYTICAL METHODS

All monitoring wells at the site are to be sampled and analyzed for the constituents listed in Table 1 below, in accordance with 257.94(b).

Table 1—Constituents to be Tested

PART 257 APPENDIX	CONSTITUENT	METHOD NUMBER
III	Boron	6010B
III	Calcium	6010B
III	Chloride	9056
III	Fluoride	9056
III	pH	9040C
III	Sulfate	9056
III	Total Dissolved Solids	160.1
PART 257 APPENDIX	**CONSTITUENT**	**METHOD NUMBER**
IV	Antimony	6010B
IV	Arsenic	6010B
IV	Barium	6010B
IV	Beryllium	6010B
IV	Cadmium	6010B
IV	Chromium	6010B
IV	Cobalt	6010B
IV	Fluoride*	9056
IV	Lead	6010B
IV	Lithium	6010B
IV	Mercury	7470A
IV	Molybdenum	6010B
IV	Selenium	6010B
IV	Thallium	6010B
IV	Radium 226/228	903.1/904.0

*Fluoride is listed twice in Table 1 because Part 257 includes it in both Appendices III and IV

Approved analytical methods to be used for testing are listed for each constituent in Table 1; equivalent or better methods may be substituted.

4.2 MONITORING FREQUENCY

Eight (8) background samples will be obtained quarterly in accordance with 257.93(d) and .94(b). This interval is estimated to be sufficient to obtain "statistically independent" samples.

Upon completion of the background sampling, the groundwater monitoring wells will be sampled twice a year at 6-month intervals in accordance with 257.94(b). An effort will be made to sample consistently in the same (2) months each year.

4.3 STATISTICAL METHODS

Once background sampling is completed, statistical evaluation of Appendix III detection groundwater-monitoring constituents is required in accordance with 257.93(f) and .94(a). The statistical analysis will meet the standards described in 257.93(g), and will include the use of time series charts, Shewhart-CUSUM control charts for normally-distributed data, and prediction intervals for data that could not be normalized. Intra-well statistical methods will be used except for constituents with significant upgradient concentrations, in which case inter-well methods may be used.

Statistical analysis will be performed on each of the Appendix III constituents that are detected in downgradient wells, using methods cited above that are appropriate for the distribution of the concentration values of the constituents. Statistical analysis will commence upon completion of the first detection monitoring event for each downgradient well.

A Statistically Significant Increase (SSI) will be determined using procedures as described above and outlined in 257.93(g) and (h). The analysis will be aided by an electronic database used in conjunction with software suited to statistical analysis of groundwater. An unconfirmed SSI can be verified by resampling within sixty (60) days of determining the unconfirmed SSI.

Unless an Alternate Source Demonstration is completed in accordance with 257.94(e)(2), assessment monitoring will be implemented in accordance with 257.93(h) and 257.95 whenever a SSI has been confirmed for one or more of the Appendix III constituents. In accordance with 257.95(b), within ninety (90) days of confirming an SSI, and annually thereafter, each well will be sampled for all Appendix IV constituents, in addition to the routinely sampled Appendix III constituents. Any constituent(s) detected as a result of the Appendix IV analysis will continue to be analyzed during subsequent semiannual events in accordance with 257.95(d)(1). Eight (8)semiannual samples from each well will be collected and analyzed for the detected Appendix IV constituents to establish background levels for the additional Appendix IV constituent(s). In accordance with 257.95(e), if all of the Appendix III and IV constituents fall below statistical background levels for two (2) consecutive events, normal detection monitoring of Appendix III constituents will resume. If concentrations of any constituents remain above background levels, assessment monitoring will continue in accordance with 257.95(f).

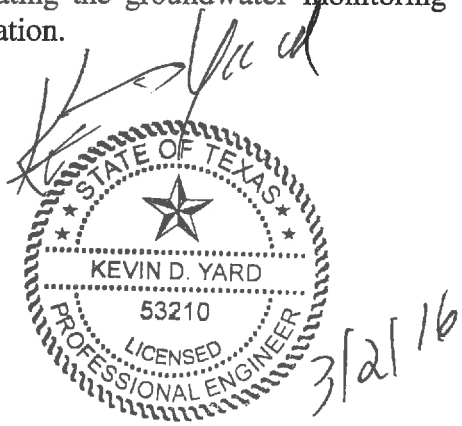
If one or more of the Appendix III or IV constituents exceeds the background statistical level established by eight (8) events, one of following two (2) procedures will be implemented:

(1) Procedures listed in 257.95(g) will be followed, including implement Assessment of Corrective Measures as detailed in 257.96 and subsequent actions detailed in 257.97 and .98. The nature and extent of any release will be characterized. At least one (1) additional monitoring well will be installed between the monitoring well with the SSI and the site boundary.

(2) Demonstrate a source other than the facility is the cause of the SSI in accordance with 257.95(g)(3)(ii).

4.4 PROFESSIONAL ENGINEER'S CERTIFICATION

Consistent with §257.93(f)(6), I, the undersigned, hereby certify that the statistical method, as described above, is appropriate for evaluating the groundwater monitoring data for the CCR landfill at the Sandy Creek Energy Station.



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4.5 REPORTING AND SUBMITTALS

All reports will be prepared under the supervision of and certified by a qualified professional engineer licensed in the State of Texas. Recordkeeping, reporting, and public notification will be implemented in accordance with 257.105 through .107. An annual groundwater monitoring report will be prepared in accordance with 257.105(h), placed in the site operating records, and posted to the internet in accordance with 257.107. Quarterly and semiannual reports will be prepared in accordance with 257.105(h)(6), placed in the site operating record, and posted to the internet in accordance with 257.107.