SELECTION OF STATISTICAL METHOD CERTIFICATION
GROUNDWATER MONITORING SAMPLING AND ANALYSIS PROGRAM
DISPOSAL AREA 8
U.S. EPA COAL COMBUSTION RESIDUALS RULE

BRUNNER ISLAND STEAM ELECTRIC STATION
EAST MANCHESTER TOWNSHIP
YORK COUNTY, PENNSYLVANIA

Prepared for:

BRUNNER ISLAND, LLC
East Manchester Township
York County, Pennsylvania

TALEN ENERGY ™

Prepared by:

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SELECTION OF STATISTICAL METHOD CERTIFICATION
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Disposal Area 8 - U.S. EPA Coal Combustion Residuals Rule
Brunner Island Steam Electric Station, East Manchester Township, York County, Pennsylvania

Advanced GeoServices Corp. (Advanced GeoServices) has been retained by Brunner Island, LLC to select the statistical method(s) for evaluating groundwater monitoring data at the above referenced facility as required by 40 C.F.R. § 257.93. Presented below are the project background, assessment, limitations, and certification.

1.1 BACKGROUND

Pursuant to 40 C.F.R. § 257.90(b)(2), existing CCR landfill units must develop a groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by 40 C.F.R. § 257.93. 40 C.F.R. § 257.93(f) requires the owner or operator of the CCR unit to select one of the statistical methods specified in (1) through (5) below to be used in evaluating groundwater monitoring data for each specified constituent.

1) A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.
2) An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.
3) A tolerance or 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 tolerance or prediction limit.
4) A control chart approach that gives control limits for each constituent.
5) Another statistical test method that meets the performance standards of 40 C.F.R. § 257.93(g).

The statistical test chosen shall be conducted separately for each constituent in each monitoring well.

Pursuant to 40 C.F.R. § 257.93(f)(6), the owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data.

In support of this requirement, Advanced GeoServices completed an evaluation of the statistical method selected for evaluating the groundwater monitoring data associated with the above-referenced CCR unit and determined that sufficient information is available to make the certification required under 40 C.F.R. § 257.93(f)(6).

2.0 NARRATIVE DESCRIPTION OF CHOSEN STATISTICAL METHOD

Based upon a review of applicable information, Advanced GeoServices concludes as follows:

The analysis of variance method, specified in 40 CFR 257.93(f)(1) and (2), will be used to detect statistically-significant increases (SSI) of each constituent in the groundwater monitoring wells. The analysis of variance is selected based on a review of the EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance (2009), as well as preliminary analysis of the data. Each constituent will be evaluated separately using the most appropriate method for its individual characteristics.

The statistical analysis procedure will begin by testing each data set for the key requirements of analysis-of-variance methods. Each data set will be tested for normality; non-normally-distributed data will be transformed as described below. Each data set will also be tested for temporal trends and transformed as described below.

2.1 Compliance with performance standards

The rules in 40 CFR 257.93(g) requires that the chosen statistical method comply with specific performance standards. We address each of the applicable performance standards below with a brief description of how we will conduct the analysis.

2.1.1 Normal and non-normal distributed data

Section 40 CFR 257.93(g)(1) specifies that the statistical method "shall be appropriate for the distribution of constituents." If the background data are normally distributed or can be normalized (e.g. by a log or Box-Cox transformation) we will use a parametric analysis of variance. If the background data cannot be normalized, possibly because of a large fraction of non-detects, we will use a non-parametric (rank-based) analysis of variance. We will evaluate the distributions of each constituent individually and select the appropriate method.

2.1.2 Type I error levels

We perform the analyses of variance to comply with the requirement in Section 40 CFR 257.93(g)(2), which specifies that tests must be done at a comparison-wise Type I error level no less than 0.01 and an experiment-wise Type I error level no less than 0.05.

2.1.3 Data below detection limit

Section 40 CFR 257.93(g)(5) specifies that the statistical method must account for data below the detection limit, also called "non-detects" or "censored data". We will use non-parametric analysis of variance methods for comparing data sets that contain non-detects.

2.1.4 Temporal and spatial variability

Section 40 CFR 257.93(g)(6) requires that, if necessary, the statistical method must include "procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data." We will remove seasonal variations, when appropriate, by subtracting seasonal means or using an ANOVA for seasonal effects. The locations of the background wells have been chosen to minimize natural spatial variability between them and their associated monitoring wells. However, if there is evidence of natural spatial variability that would make interwell comparisons infeasible, we will use intrawell comparisons. The data were developed at regular intervals to reduce the temporal autocorrelation. If the data show evidence of temporal correlation such as trends, we will remove the trends using appropriate statistical methods.

2.2 Other Statistical methods

If the data set does not lend itself to this method, an appropriate method from the remaining methods listed in 257.93(f) will be chosen and this Certification Statement will be updated.

3.0 LIMITATIONS

Advanced GeoServices represents that to the best of our knowledge, information, and belief in the exercise of its professional judgment, it is our professional opinion that the aforementioned information is accurate as of the date of such signature. This opinion is based on experience, qualifications, and professional judgment and is not to be construed as a warranty or guaranty. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data is obtained, despite the use of due care.

4.0 CERTIFICATION

I, Christopher T. Reitman, being a Registered Professional Engineer, in accordance with the Pennsylvania Professional Engineer's Registration, do hereby certify to the best of my knowledge, information, and belief, that, pursuant to 40 C.F.R. § 257.93, the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area dated October 17, 2017, and is true and correct and has been prepared in accordance with generally accepted good engineering practices.

SIGNATURE ______________________________ DATE October 17, 2017

Christopher T. Reitman

COMMONWEALTH OF PENNSYLVANIA
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