

**CLECO CAJUN LLC  
BIG CAJUN II POWER PLANT**

**Groundwater Monitoring  
Certification of Statistical Method**

**October 2019**



## INTRODUCTION

This certification of statistical method has been prepared and certified per §257.93.f.6 for the groundwater monitoring program conducted at the Cleco Cajun, LLC Big Cajun II Power Plant. Groundwater monitoring is conducted to evaluate groundwater quality for the facilities which handle wastes regulated by the Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule. The following describes statistical analysis procedures to be followed at Big Cajun II for the various monitoring regimes outlined in the CCR Rule.

## DETECTION MONITORING STATISTICAL ANALYSIS

While conducting a Detection Monitoring program, statistical evaluations of groundwater monitoring data for the permitted CCR facilities will be performed using prediction limits per §257.93.f. These statistical evaluations will be conducted per performance criteria outlined in applicable portions of §275.93.g and the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance* (EPA, 2009). The number of samples collected, the frequency of collection, and the management of non-detect data will be consistent with the statistical method selected. The data set to be considered in the statistical analysis will include data generated from the implementation of the CCR groundwater monitoring program.

The goal of Detection Monitoring statistical evaluation is to determine if there is statistically significant evidence to show that facility operations may have adversely affected groundwater quality downgradient of the CCR facility. As shown in the decision logic flowchart for Detection Monitoring (Figure 1), an evaluation of upgradient well data will be performed first before determining which statistical evaluation approach will be selected. If the background wells are not impacted by a release from any CCR facility and have groundwater quality statistically similar to downgradient wells (assuming no impacts from the CCR facility in the downgradient wells), then interwell statistical evaluation will be performed. If the initial sampling results indicate that background groundwater is statistically dissimilar to downgradient groundwater, then intrawell statistical evaluation will be performed. These techniques are discussed below.

- Interwell statistical evaluations involve an upgradient/downgradient comparison to determine if there are any statistically significant increases (SSIs) between groundwater quality upgradient and groundwater quality downgradient of the CCR facility. Interwell prediction limits will be constructed from the upgradient well data and based on the distribution of that data for each parameter. Normal distributions of data values use parametric methods. Non-normal distributions use non-parametric methods, in which case, the prediction limit is based on the highest value in the background data set. The most recent result for each downgradient well for each parameter will be compared to the applicable prediction limit.
- Intrawell statistical evaluations are within well comparisons. In the case of intrawell prediction limits, historical data from within a given well for a given parameter will be used to construct a limit. Compliance points will be compared to the limit to determine whether a change is occurring on a per-well/per-parameter basis. Normal distributions of data values use parametric methods. Non-normal distributions use non-parametric methods, in which case, the prediction limit is based on the highest value in the background

data set. (Note that both upper and lower prediction limits will be used for intrawell evaluations of pH.)

Intrawell limit-based tests are recommended when there is evidence of natural spatial variability in groundwater quality, particularly among unimpacted upgradient wells, as it is inappropriate to pool those data across wells for the purpose of creating interwell limits for comparison with downgradient well data. Intrawell tests may be used at both new and existing facilities. Data used in intrawell limit-based tests will be screened for outliers, which, if found, will be removed from the background data set prior to constructing limits for each well/parameter pair.

An integral part of using prediction limits for statistical evaluation of Detection Monitoring data is the selection of a verification resampling strategy. For this site, a 1/2 verification resampling strategy will be used to lower the site-wide false positive rate (SWFPR). Verification resampling is mathematically incorporated into the prediction limit calculations, which improves statistical power while maintaining the SWFPR. Note that in the event intrawell statistical evaluations are performed that verification resampling for SSIs will only be conducted for SSIs generated in downgradient wells. Intrawell statistics will be performed on all wells; however, since the goal of the statistical evaluation is to determine if there is statistically significant evidence to show that facility operations may have adversely affected groundwater quality downgradient of the CCR facility, only downgradient wells will be subject to verification resampling.

In the event that Detection Monitoring SSIs are reported, verification resampling will be conducted for the appropriate well/parameter pairs. If SSIs are confirmed through verification resampling, the timelines listed in either §257.94.e.1 or §257.94.e.2 will be followed.

## **ASSESSMENT MONITORING STATISTICAL ANALYSIS**

When Assessment Monitoring is initiated because of confirmed SSIs observed during the Detection Monitoring program, detected Appendix IV parameters are compared to Groundwater Protection Standards (GWPS) through the use of Confidence Intervals. The GWPS will be either the Maximum Contaminant Level (MCL) or a statistical limit based on background, whichever is higher (§257.95.h). CCR Rule specified levels are used for parameters without MCLs (unless background is higher) which include: cobalt, lithium and molybdenum. Alternate contaminant levels (ACLs) will be established from upgradient wells through the use of Tolerance Limits. On an annual basis, all Appendix IV parameters will be sampled (§257.95.b) and newly detected parameters added to the list of parameters sampled semi-annually (§257.95.d).

Confidence intervals require a minimum of four samples; however, eight samples are recommended. When a well/constituent pair does not have the minimum sample requirement, the well/constituent pair will continue to be reported and tracked using time series plots and/or trend tests until such time that enough data are available to calculate a confidence interval.

In Assessment Monitoring, a well is determined to be out of compliance when the Lower Confidence Limit (LCL), or the entire interval, exceeds the GWPS as discussed in the EPA *Unified Guidance*. Assessment of corrective measures will be initiated at that time (§257.95.g) and remediation efforts will continue to be evaluated through the use of Confidence Intervals to determine the effectiveness of the selected remediation method.

## CORRECTIVE ACTION STATISTICAL ANALYSIS

If Corrective Action Monitoring is initiated, this information will be placed in the operating record and, if possible, an alternative source demonstration (ASD) will be made (§257.95.g.3.ii). If there is evidence of a release or if an ASD is not made for the exceedances of GWPS, efforts will be made to characterize the nature and extent of the release and initiate the assessment of corrective action measures.

Once remediation activities begin, semi-annual sampling will continue (§257.98.a.1) and Confidence Intervals will monitor the progress of remediation efforts. Confidence Intervals are compared to GWPS, which are determined as described in the preceding section.

In Corrective Action, a well/parameter pair is declared clean when the entire interval falls below a specified clean-up limit (i.e., the Upper Confidence Limit [UCL] falls below the limit). Alternatively, compliance is achieved when the Lower Confidence Limit (LCL) of the Appendix IV parameters does not exceed the GWPS for a period of three consecutive years (§257.98.c).

## CERTIFICATION

I hereby certify that the selected statistical methodology as described above is appropriate for evaluating the groundwater monitoring data for the CCR management areas at the Cleco Cajun, LLC Big Cajun II Power Plant. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.





, P.E.

Date: 9/30/2019

Louisiana Registration No.: 27124

Figure 1

