DOLET HILLS POWER STATION
MANSFIELD, LOUISIANA

CLECO

CERTIFICATION OF
STATISTICAL METHODOLOGY

STATISTICAL ANALYSIS

Statistical evaluations of groundwater monitoring data for the permitted Coal Combustion Residuals (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* (U.S. Environmental Protection Agency, March, 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 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. 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. If the assumption of normality is not rejected for the upgradient data set, then a parametric prediction limit will be calculated. If the assumption of normality is rejected for the upgradient data set, then a non-parametric prediction limit will be calculated, in which case, the prediction limit will be based on the highest value in the upgradient 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. If the assumption of normality is not rejected for the background data set, then a parametric prediction limit will be calculated. If the assumption of normality is rejected for the background data set, then a non-parametric prediction limit will be calculated, in which case, the prediction limit will be 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 groundwater data is the selection of a verification resampling strategy. For the Cleco Power, LLC sites, 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 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.

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 Power, LLC Dolet Hills Power Station. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.

_____, P.E.

Date: 10/12/17

Louisiana Registration No.: 27124

Figure 1

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                  ┌─────────────────────────────────────────┐
                  │  Detection Monitoring (DM) – Background N>8  │
                  └─────────────────────────────────────────┘
                                    │
                  ┌─────────────────────────────────────────┐
                  │          Variation Upgradient            │
                  └─────────────────────────────────────────┘
              YES /                                    \ NO
   ┌──────────────────────┐                   ┌──────────────────────┐
   │  Intrawell Prediction │                   │  Interwell Prediction │
   │        Limits         │                   │        Limits         │
   └──────────────────────┘                   └──────────────────────┘
              \          ┌─────────────────────────┐          /
               └────────▶│   Presecreen Data for   │◀────────┘
                         │    Outliers/Trends/     │
                         │      Seasonality        │
                         └─────────────────────────┘
                                    │
                         ┌─────────────────────────┐
                         │   Data Normal or         │
                         │  Transformed Normal      │
                         └─────────────────────────┘
              YES /                                    \ NO
   ┌──────────────────────┐                   ┌──────────────────────┐
   │  Parametric Prediction│                   │ Nonparametric Prediction│
   │         Limit         │                   │         Limit          │
   └──────────────────────┘                   └──────────────────────┘
              \          ┌─────────────────────────┐          /
               └────────▶│  Statistical Exceedance │◀────────┘
                         └─────────────────────────┘
              YES /                                    \ NO
   ┌──────────────────────┐                   ┌──────────────────────┐
   │  Collect Independent  │                   │   Continue to Next    │
   │ Resample within 90 days│                  │   Sampling Event      │
   └──────────────────────┘                   └──────────────────────┘
              │
   ┌──────────────────────────────────┐
   │  Resample Confirms Exceedance?    │───NO───┐
   └──────────────────────────────────┘        │
       YES │                 │ YES             │
   ┌──────────────┐   ┌──────────────────┐   ┌──────────────────────┐
   │  Alternate   │   │     Initiate     │   │   Continue to Next    │
   │   Source     │◀─OR─▶│   Assessment   │   │   Sampling Event      │
   │ Demonstration│   │  Monitoring (AM) │   └──────────────────────┘
   └──────────────┘   └──────────────────┘
                              │
                      ┌──────────────────────┐
                      │ Confidence Intervals -│
                      │         GWPS          │
                      └──────────────────────┘

   ┌──────────────┐
   │  Confidence  │
   │  Intervals   │───YES───▶┌──────────────────────────────┐
   │  Exceeds?    │          │ Alternate Source Demonstration │
   └──────────────┘          └──────────────────────────────┘
       NO │                              OR ▲│
   ┌──────────────┐                   ┌──────────────────────┐
   │ Continue DM & AM │               │   Corrective Action   │
   │   Programs   │                   └──────────────────────┘
   └──────────────┘
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