

# Automated Data Analysis and Decision Making to Support Pump and Treat Shutdown Evaluation

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**Background/Objectives.** At a former industrial facility in the Caribbean, a pump and treat (P&T) system was operated to address a contaminated groundwater plume associated with a petroleum-based DNAPL (petroDNAPL) body. The P&T system was costly, aging, diminishing in effectiveness, and required off-island disposal of hazardous waste. Based on the hypothesis that the plume was stable without pumping; regulatory approval was obtained to shut the system down for an initial one-year period to assess the stability of the petroDNAPL body and associated groundwater plume. Monthly monitoring events were performed to assess in-well petroDNAPL thickness, groundwater elevations, and groundwater concentration trends. Monitoring data were compared with rigorous, pre-determined criteria to assess the stability hypothesis. Quarterly meetings were held with the regulator to review the data and determine if the shutdown evaluation would continue or if the P&T system would restart. Large amounts of data needed to be evaluated at a high frequency to support this process. Data flows, data analysis, and decision criteria evaluation were automated to streamline the P&T shutdown evaluation.

**Approach/Activities.** Data flows from the field to the database were completely digitized for fluid level gauging data, water quality parameters, groundwater analytical, rainfall, and earthquake data. Once in the database, scripts were developed to inventory and check data for completeness. Scripts were also developed to automate evaluation of decision criteria, including presence/absence of in-well petroDNAPL or groundwater exceedances in sentinel wells, statistically significant increasing trends in wells proximal to the petroDNAPL body, statistically significant increasing trends in total plume mass (calculated using Thiessen polygons), and whether the center of mass (calculated using Thiessen polygons) was advancing downgradient. Results were summarized for team view in a web-accessible dashboard, which also plotted historical data sets and generated plume maps. Dashboard access was granted to the regulator to allow for prompt regulatory review of data and quarterly reports. The dashboard was referenced in status reports for detailed presentation of data, figures, and plume maps.

**Results/Lessons Learned.** Data analysis and decision making were successfully automated for efficient tracking of a P&T shutdown evaluation. The dashboard developed for this project was an effective reporting interface and holds promise for use as a go-between for the regulatory administrative record. After automating data analysis, hours spent by the project team for data analysis and reporting decreased by 25 percent. Further project savings may be incurred through automated report generation using machine learning.

After the results from the first year of the P&T shutdown evaluation supported the plume stability hypothesis, the regulator granted a two-year extension to continue the evaluation. For each year that the P&T system remained off, additional significant operations and maintenance costs were avoided; a portion of which was repurposed to support the P&T transition effort.