Achieving Groundwater Monitoring Optimization at SRS: A Core Team Process Based on Rigorous Technical Assessment

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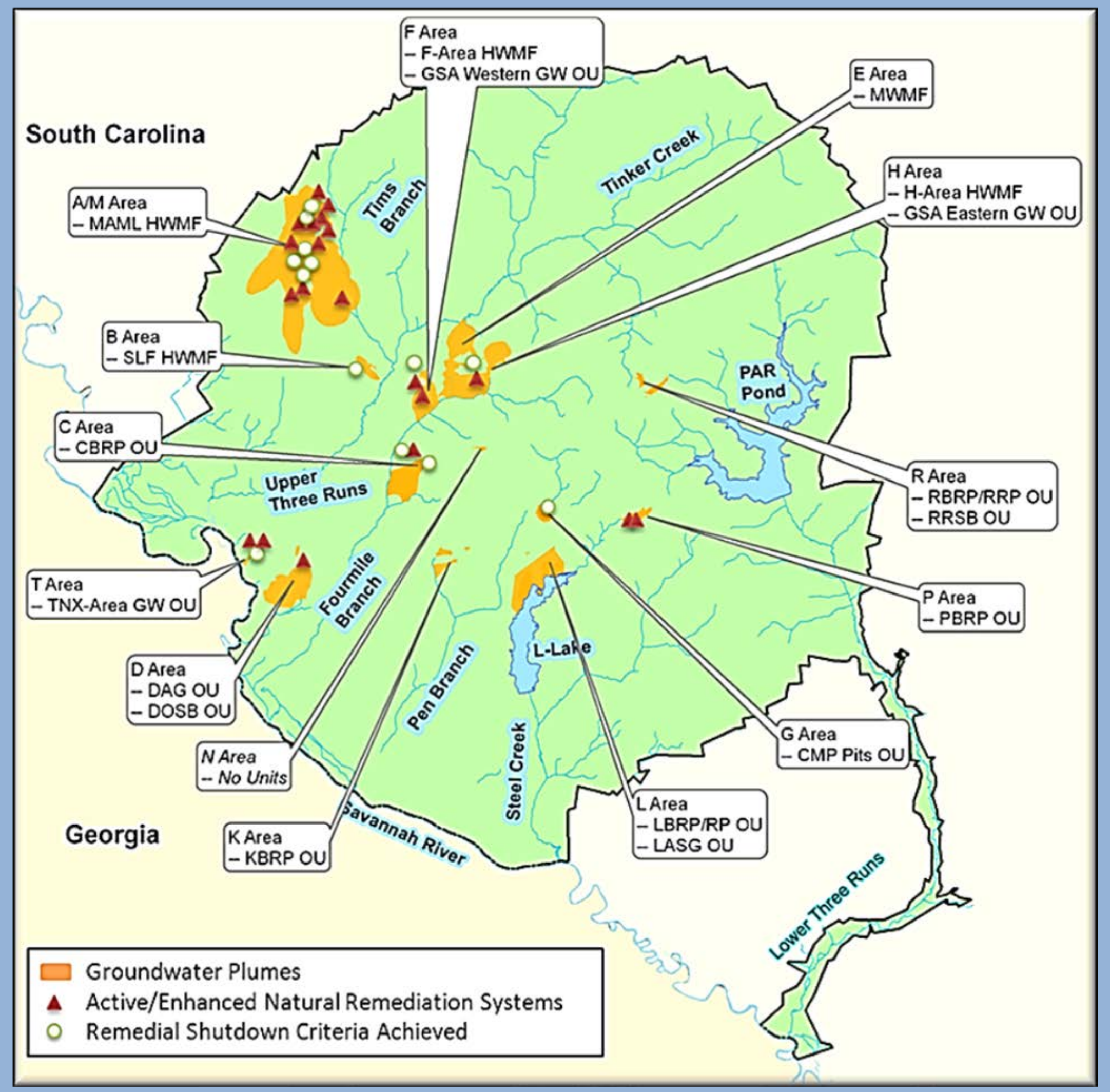
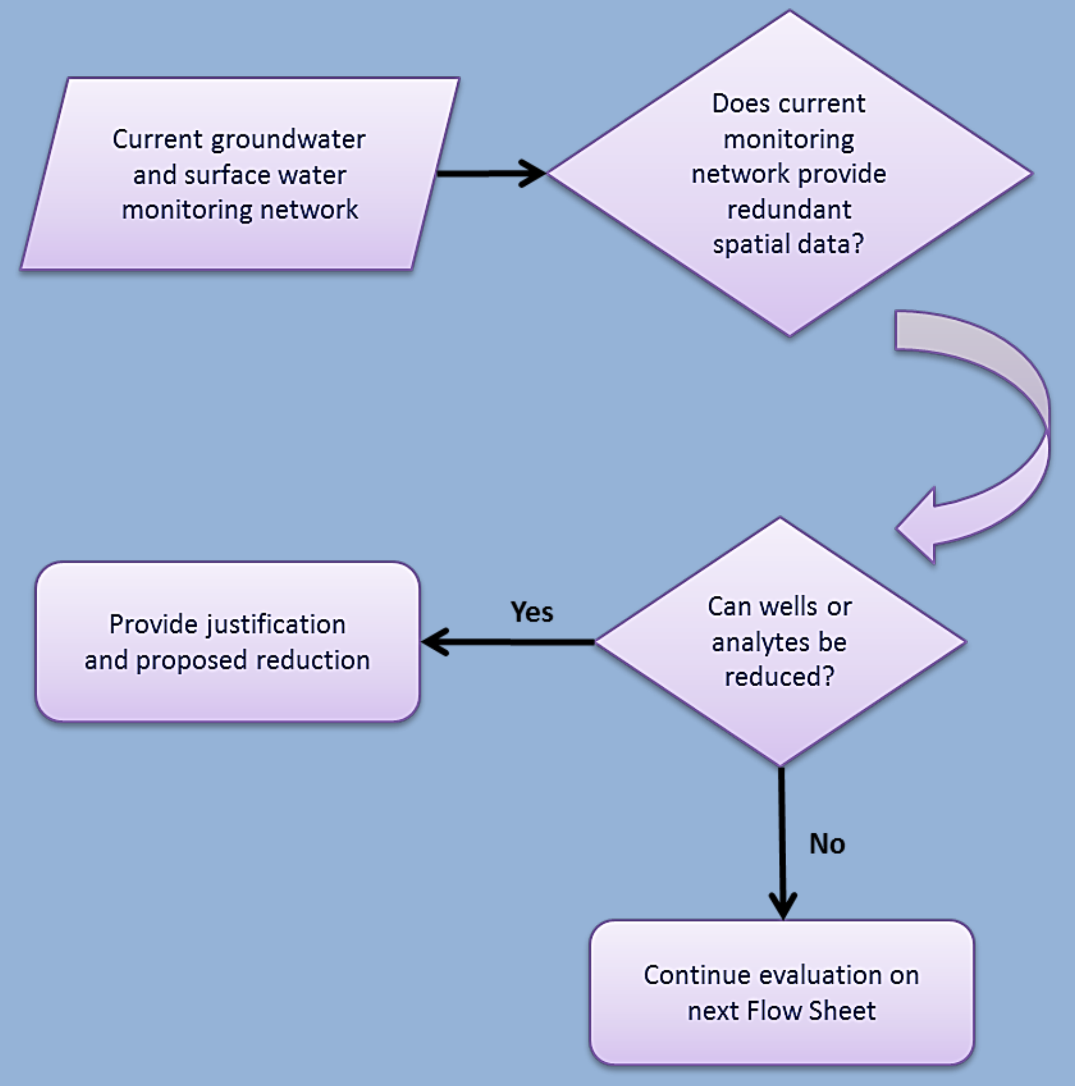
Introduction



Groundwater monitoring at SRS includes about 4,000 samples from nearly 3,000 wells annually. Many soil and vadose zone remediations are complete, but 18 remaining groundwater plumes are monitored under the Federal Facility Agreement and the RCRA Permit. Monitoring conducted under regulatory approved plans including pre-decisional, post-remedy, and post- closure monitoring. Based on the current size and expected longevity of the monitoring program, the associated sampling and reporting is a significant long-term cost that represents an increasing proportion of the environmental management budget . Therefore, a comprehensive evaluation of the monitoring program was conducted to identify areas of optimization.

Methods

The stage of the project lifecycle drives the monitoring objectives. For example, requirements for detection monitoring are very different than for corrective action effectiveness monitoring, which may consist of short-term remediation system monitoring or long-term monitoring of natural attenuation. Optimization decision logic flow sheets were developed for five assessment areas; (1) current monitoring v. decision making requirements, (2) spatial redundancy, (3) temporal conditions, (4) analyte needs, and (5) reporting requirements.



Current groundwater and surface water monitoring network

Does current monitoring network provide redundant spatial data?

Can wells or analytes be reduced?

Yes

Provide justification and proposed reduction

No

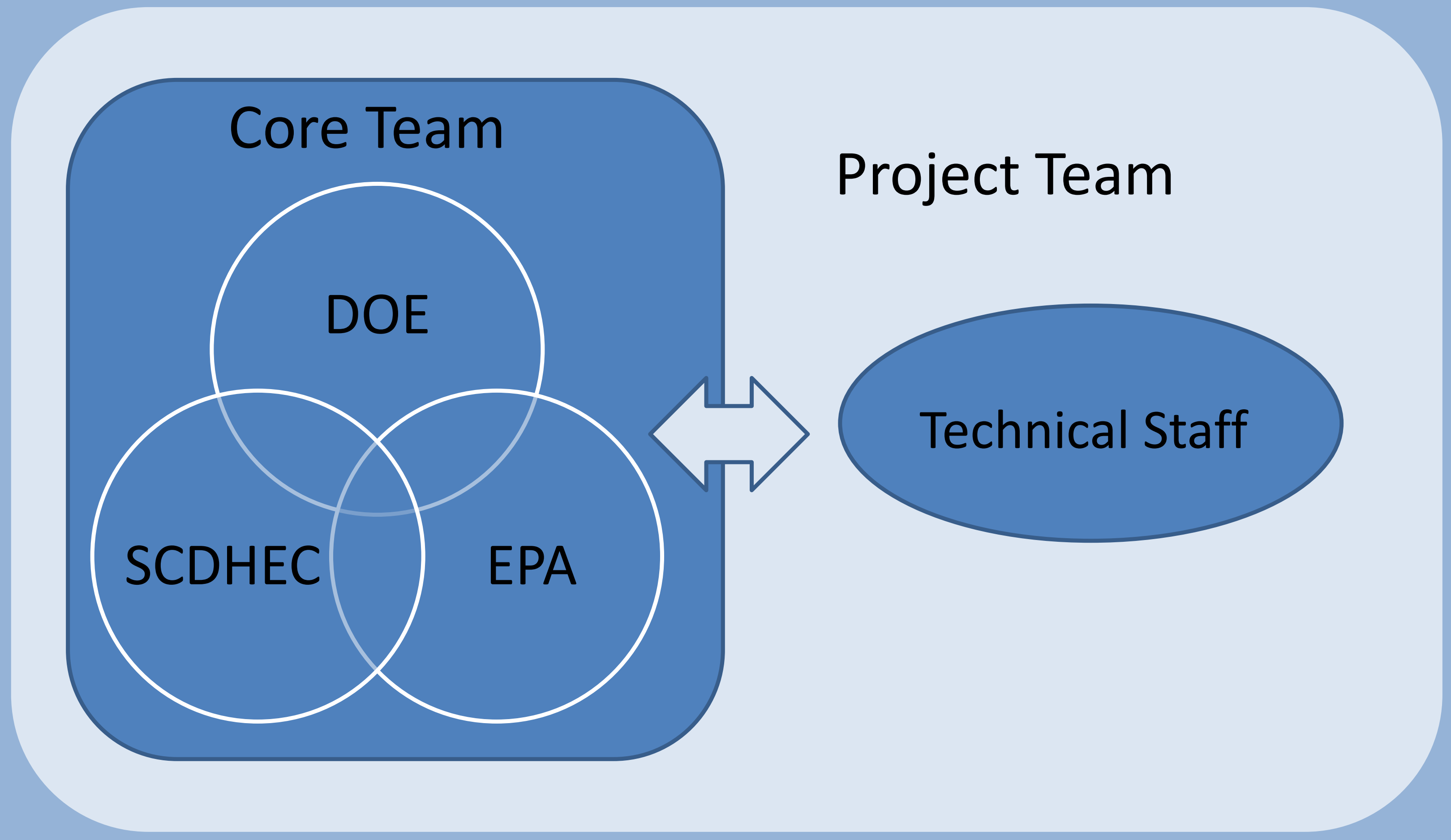
Continue evaluation on next Flow Sheet

Spatial Redundancy Evaluation

For each aquifer unit, consider the following (or other) questions:

- Are source well(s) providing unique data regarding each source and located at historic maximum concentration locations?
- Are plume boundary wells demonstrating that the plume is not expanding, discharging to surface water, and is consistent with model predictions?
- Has flow velocity or direction changed since the monitoring network was established?
- Are intermediate plume wells providing trending information on key contaminants?
- Is plume vertically bounded? Are wells focused on high concentration zones and predicted zones of breakthrough?

The decision- making process at SRS follows the environmental restoration principles, which are grounded in accurately and concisely defining the problem, and determining the preferred response to the problem. The first principle is building an effective core team, which is comprised of those individuals with the authority to make decisions. Core team meetings (scoping meetings) provide the forum for agreement on project direction prior to work execution. The core team process was established at SRS in 1998, consisting of representatives from DOE, USEPA, and SCDHEC. The core team functions as the decision makers for each of the RCRA/CERCLA operable units, and also comes to agreement on programmatic issues affecting all operable units. Agreement on groundwater optimization was reached using this core team process, first programmatically and then on a unit by unit basis.



Core Team

DOE

SCDHEC

EPA

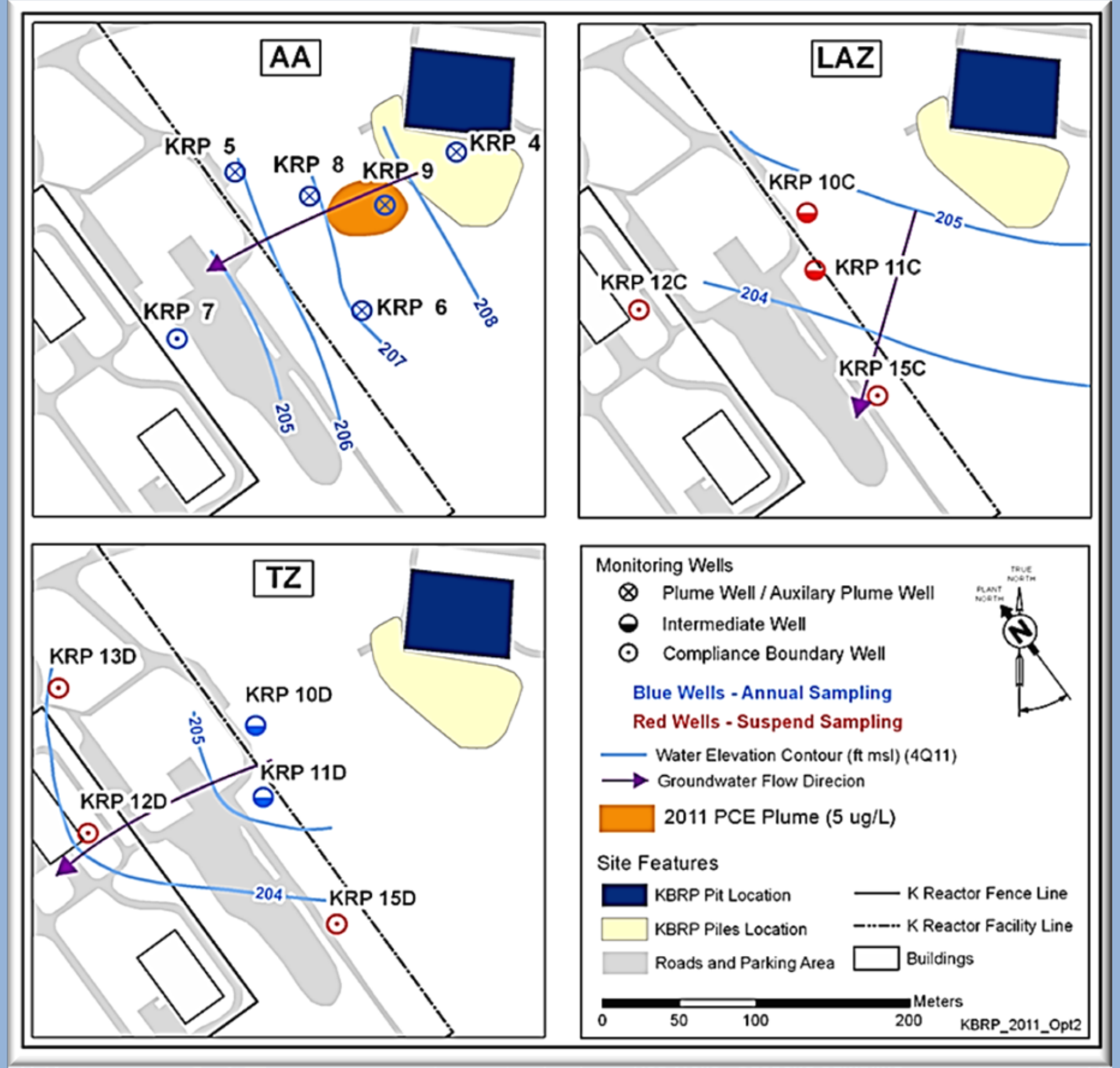
Project Team

Technical Staff

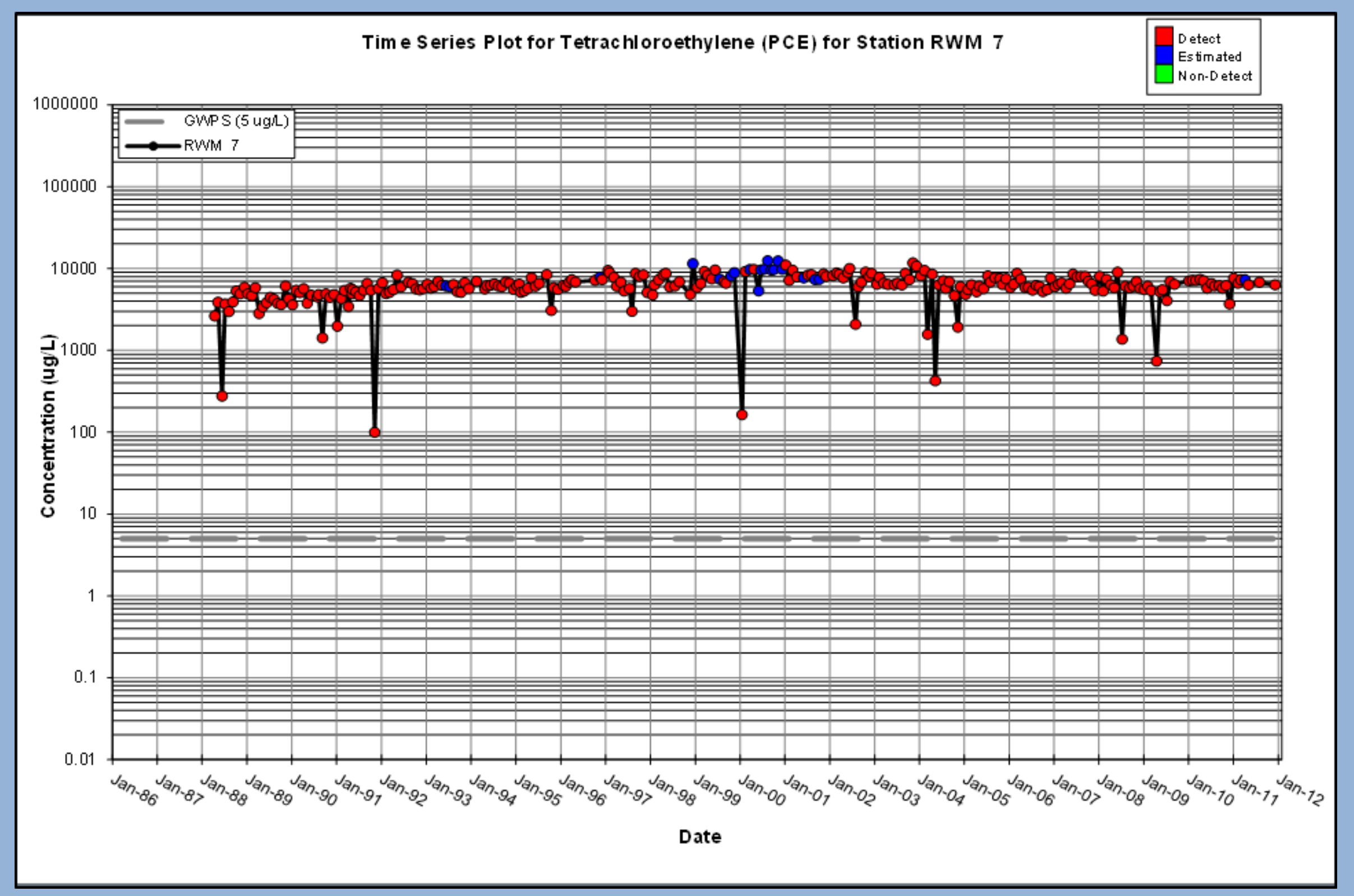
Spatial Optimization at K-Area Burning Rubble Pits

Monitoring is required for the Monitored Natural Attenuation remedy. Previously 15 wells were sampled semi-annually. The plume is limited to the water table aquifer (AA horizon), with only 3 wells having consistent detections; and is contracting. Optimization includes:

- Suspend sampling in all LAZ wells (deepest aquifer zone) as TZ is clean
- Suspend sampling in TZ Compliance Boundary wells since the two Intermediate wells are clean.
- Change to annual sampling for well network based on historic data and slow temporal changes in plume.



Temporal Optimization of Remediation Wells



Sampling Frequency	VOC Removal (lbs)	Percent Difference
Monthly	36954	NA
Bimonthly (Even Months)	37504	1.5
Bimonthly (Odd Months)	36404	-1.5
Quarterly (1,4,7,10)	36945	0.0
Quarterly (2,5,8,11)	37782	2.2
Quarterly (3,6,9,12)	36135	-2.2

Monthly sampling of 11 recovery wells for 25 years demonstrated stable or decreasing trends over time. Statistical analysis of the data indicated insignificant differences in the calculated pounds removed by the system using data collected less frequently. The RCRA permit was modified by SCDHEC to change to quarterly sampling.

Results

For each groundwater unit, the following metrics were summarized 1) proposed changes to the number of monitoring wells sampled; 2) reductions/increases in the monitoring frequencies; 3) reductions/increases to the monitored analytes; and 4) changes in reporting frequencies. Monitoring was discontinued at 72 wells, and added at 16 wells; and the sampling frequency reduced at 246 wells. Analytes were reduced at 363 wells and added at 75 wells, mostly 1,4-dioxane, an emerging contaminant. Finally, the reporting frequency was reduced at five units. Overall, optimization recommendations were made at 15 of the 18 units assessed, and the associated cost savings to date is over $400,000 per year.

Conclusions

The high of rate success can be attributed to a strong working relationship with EPA and SCDHEC. An early programmatic groundwater optimization scoping meeting helped ensure the success of this optimization effort, as the technical evaluation was conducted after getting core team buy-in for the goals and methods of the project. The optimization process used at SRS can be applied broadly to other DOE facilities, federal facilities, and private RCRA- or CERCLA-regulated sites. This process relies on a clear understanding and agreement on monitoring goals and objectives by all stakeholders, and is tailored to the specific characteristics of each individual unit evaluated.