

LTMO Review Checklist

Purpose:

This checklist is intended to guide regulators, clients, and other interested parties through the process of reviewing proposed optimization of long-term monitoring (LTM) programs prepared by contractors or regulated parties. It is meant as a guide only and does not claim to address all issues and concerns that may arise with optimization of an LTM program at a particular site. Technical reviews of LTM optimization reports or proposals requires some technical expertise in hydrogeology, contaminant transport processes, chemistry, and/or statistics and involve some qualitative review of the LTM program on the part of the reviewer(s).

General:

- Methods/approaches used address both redundancies and data gaps.
- Personnel performing the analyses and preparing the report have the requisite technical qualifications (e.g., hydrogeology, statistics, environmental chemistry, etc.).
- Personnel have the necessary professional registrations (if applicable).
- Results of any statistical or graphical analysis are provided in appendices. (All output from computer-based tools or other quantitative approach should be provided for review in report appendices or via electronic submittal).
- The rationale for the recommendations from the qualitative analysis is clear and detailed.
 - The bases for the recommendations must be reasonable from a technical point of view. Even if the actual recommendation (e.g., annual sampling are subject to debate, if agreement can be reached on the rationale (e.g., slow ground water flow velocity), discussions can be more focused.
- Recommended sampling events are logistically feasible.
 - The sampling events are scheduled for seasons that would pose fewer hardships for the sampling crews.
 - Wells to be sampled can be expected to be available at the times when the sampling would be scheduled (e.g., domestic wells at summer homes, irrigation wells).
 - Recommended sampling frequencies for the various wells avoid multiple mobilizations to the extent possible.

Evaluation of the Data Used in the Optimization Study:

- Data used in the analyses are clearly indicated.
- The bases for excluding any data are clearly identified.
- Data used in the analyses are comparable in quality and valid.
- Data are adequate for the types of analysis conducted (e.g., for Mann-Kendall testing, geostatistical analysis).
- Ground water data were collected over a time period that is likely to be representative of recent and future conditions near the site. (Non-routine ground water conditions in the past may form an inappropriate basis for identifying future needs).

Reviewing Recommendations Relative to Site Hydrogeology and Contaminant Behavior:

- The report describes a site conceptual model (CSM) that formed the basis for the recommendations, and this CSM is consistent with the project team's CSM.
- Recommended sampling locations and frequencies allow adequate time for modification to the remedy before contamination reaches an exposure point or before unacceptable migration occurs.
- Recommendations consider known or suspected preferential ground water pathways (e.g., sand channels, fractures, etc.).
- Recommendations retain wells in all vertical intervals and aquifers of interest or wells that represent potential pathways?
- Recommendations adequately consider contaminant behavior (e.g., sorption, density effects, solubility, etc.) in the remaining monitoring network.
- Wells recommended for retention in the monitoring network have reliable construction and adequate depth to allow sampling during times of a lowered water table.

Evaluation of Statistical Methods Used:

(This evaluation requires some familiarity with the statistical and geostatistical methods used. If unfamiliar with these aspects, consultation with a statistician would be appropriate).

- Trend analyses, if any, were conducted properly, and identified trends are consistent with the valid available data.
- Variograms, if any, were constructed properly, and the estimated ranges appear reasonable.
 - Variogram models were reasonable fits to the data,
 - Kriging techniques were applied properly (including any transformation of data such as the use of ranks, logarithmic transforms).

Evaluation of Recommended Changes to Program Relative to Monitoring Objectives:

- The report restates the monitoring objectives, and the stated objectives are consistent with the project team's understanding of the objectives.
- The recommended sampling frequency and monitoring network adequately consider the need to assess migration beyond the currently understood plume boundaries (downgradient, side-gradient, and vertically).
- The recommended sampling frequency and monitoring network allow for adequate assessment of progress toward remediation (e.g., monitoring near source areas and along plume axes), if applicable.
- The recommended sampling events will adequately capture the seasonal variability in concentrations, if such variability is significant?

- The changes to the monitoring program allow for the early identification of unexpected plume behavior (e.g., rebound, outside/non-site related contamination, etc.).
- Wells that will allow early warning of migration toward exposure points (e.g., production wells or surface water bodies), if applicable, are retained.
- All stakeholder concerns are addressed by the recommended monitoring program.
 - If not, unaddressed concerns are identified and an explanation provided.

Evaluation of the Recommendations Relative to Regulatory Requirements:

- Recommendations for changes to any aspects of the monitoring program do not violate federal, state, or local regulatory requirements or provisions of site-specific permits (e.g., a minimum set of monitoring points, minimum sampling frequencies, specified analytical methods or list of analytes, etc.).

Other Aspects of the Monitoring Program:

- Recommendations identify appropriate changes to the sampling or analytical methods.
- Recommended changes in the analytical suite adequately consider what analytes have and have not been previously detected at levels of concern.
- Recommended sampling methods provide data of adequate quality for the purposes.
- Adequate provisions are included in the recommended implementation of the sampling and/or analytical method changes to allow for comparison of the data collected both before and after the changes (e.g., a side-by-side comparison of the current and proposed methods).
- Recommendations address appropriate changes in reporting and data management to facilitate site decision-making and data analysis.
- Wells recommended for elimination from the monitoring network are retained for measurement of piezometric surface elevation, as appropriate, or identified for decommissioning per appropriate state or local requirements.

Evaluation of Projected Cost Impacts:

- Current sampling costs are accurately portrayed.
- Stated hourly labor rates and cost per analysis are comparable to actual past costs for the project.
- Expected changes in labor costs are reasonable given field and other constraints.
- Stated cost impacts account for the costs associated with necessary modification of the sampling plans and other documents.
- Stated cost impacts account for the costs associated with necessary well installation, additional equipment purchase or rental, method comparisons, etc.