



Overview

The Interstate Technical and Regulatory Council (ITRC) Geostatistics for Remediation Optimization (GRO) team developed this *Geospatial Analysis for Optimization at Environmental Sites* guidance (GRO-1) to help practitioners better apply geospatial analyses in environmental projects. This guidance will help state regulators and other practitioners to understand, evaluate, and make informed decisions about geospatial analyses for optimizing activities at environmental sites. The material presented here provides not only highly technical detail, but also introductory information for those who may not have expertise in this area.

[USEPA \(2012a\)](#) defines optimization as “efforts at any phase of the removal or remedial response to identify and implement specific actions that improve the effectiveness and cost-efficiency of that phase.” Geospatial analyses are tools that can evaluate optimization opportunities for the total project life cycle, providing enhanced data evaluation, interpretation, and communication for decision making. This guidance further defines geospatial analysis as a process of compiling and analyzing data that are related in time or space. In some cases, the geospatial analyses include statistical analyses involving spatial or spatial and temporal interpretations of environmental data, as well as uncertainty evaluations of those data. Geospatial analyses can help get the most information from sampling locations and results by eliminating sampling redundancy and adjusting remediation efforts through appropriate performance evaluation.

When a sufficient amount of data exist for a site (see [Table 1](#)), the results of geospatial analyses provide additional lines of evidence for optimization opportunities. Geospatial analyses may be used at environmental sites in all project life cycle stages (release detection, site characterization, remediation, monitoring and closure), in all environmental media (soil, groundwater, vapor, or sediment), and for different sizes and types of sites (for example, Brownfields, UST, RCRA). Geospatial analyses are especially useful for complex site conditions and offer a systematic approach to investigation and cleanup strategies for these sites.

This guidance document provides information at several levels of detail to accommodate different users with different informational needs:

- Are you new to geospatial analyses, or uncertain if these methods apply to your site? Begin with the [Fact Sheets](#). The fact sheets also help to explain geospatial analyses to stakeholders and those with an interest in the site, but no technical background to provide context for site activities. The [Stakeholder Perspectives](#) section includes information about communicating with stakeholders and information about potential concerns. The [Fundamental Concepts](#) section explains basic concepts, interpolation, model prediction, and uncertainty in geospatial analyses.
- Are you trying to answer specific questions about a site or a specific stage in the project life cycle? Common [optimization questions](#) are connected with the geospatial methods that may be used to support those questions.
- Have you determined that geospatial methods are appropriate for your site? Several [flow charts](#) can assist you in selecting the appropriate geospatial methods for given optimization questions and site conditions. The geospatial [work flow](#) helps you implement these methods. The [Using Results](#) section includes descriptions of using geospatial results to support different optimization activities and also some examples.
- Are you a practitioner, seeking information about specific methods or software that

will make these analyses easier? The [Methods](#) and [Software](#) sections describe different categories of methods and supporting software for applying these methods. The [Case Studies](#) section includes nine case studies that describe the use of different geospatial methods and software packages to optimize project life cycle activities.

- Are you an experienced reviewer or project manager who needs quick access to the various tools that aid in applying the geospatial analysis results? The [PM's Tool Box](#) provides links to specific topics and useful tools that can be used to review work plans or results.
- Are you a reviewer, looking for applicable methods and software used for a particular optimization question? The [Review Checklist](#) presents a comprehensive list of items of concern, with links to supporting information.

If you need more information about this web document and finding important information, [Navigating this Website](#) provides that information and answers to frequently asked questions. The [Additional Information](#) topic includes project life cycle stage descriptions, information on the history of remedial process optimization, and additional resources.