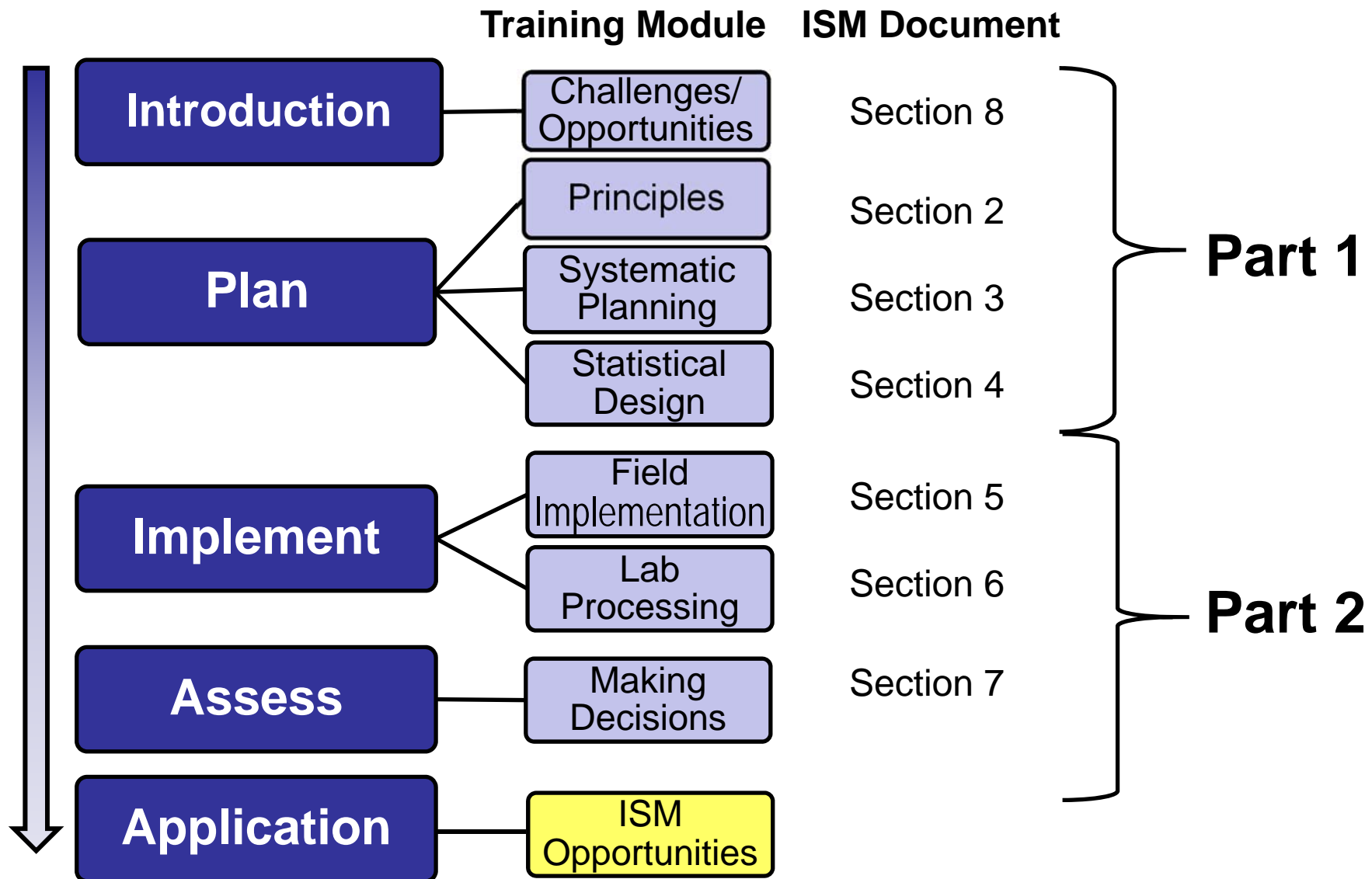


# ISM Document and Training Roadmap



# Report Documentation Page

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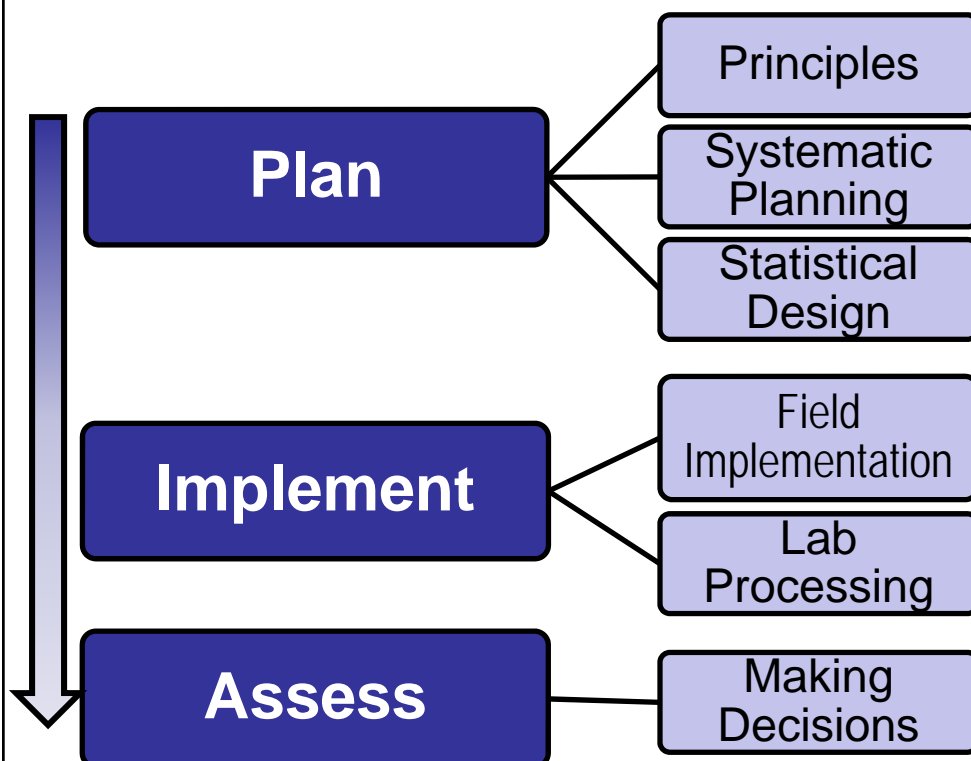
# Are You Getting a Representative Sample at Your Sites?



# ITRC's ISM Solution

Web-Based Document at:

<http://www.itrcweb.org/ISM-1/>



Executive Summary - Windows Internet Explorer provided by Booz Allen Hamilton

www.itrcweb.org/ISM-1/Executive\_Summary.html

ols Help

Incremental Sampling Methodology

INTERSTATE TECHNOLOGY COUNCIL REGULATORY

**EXECUTIVE SUMMARY** [Printer Friendly Version](#)

**ITRC**

ITRC ISM Public Pages

Incremental Sampling Methodology Homepage

1.0 Introduction

2.0 Nature of Soil Sampling and Incremental Sampling Principles

3.0 Systematic Planning and Decision Unit Designation

4.0 Statistical Sampling Designs for ISM

5.0 Field Implementation, Sample Collection and Processing

6.0 Laboratory Sample Processing and Analysis

7.0 Making Decisions Using ISM Data

8.0 Regulatory Concern with Incremental Sampling Methodology

9.0 Case Study Summaries

10. Stakeholder and Tribal Input

11.0 References

Appendix A - Statistical Simulations

Appendix B - August 2009 Survey Results

Incremental sampling methodology (ISM) is a structured composite sampling and processing protocol that reduces data variability and provides a reasonably unbiased estimate of mean contaminant concentrations in an area/volume of soil targeted for sampling. ISM provides representative samples of specific soil areas/volumes defined as decision units (DUs) by collecting numerous increments of soil (typically 30–100 increments) that are combined, processed, and subsampled according to specific protocols.

ISM is increasingly being used in the environmental field for sampling contaminants in soil. Proponents have found that the sampling density afforded by collecting many increments, together with the disciplined processing and subsampling of the combined increments, in most cases yields more consistent and reproducible results than those obtained by more traditional (i.e., discrete) sampling approaches.

In 2009 the ITRC established a technical team to evaluate ISM for sampling soils at hazardous waste sites and potentially contaminated properties. The ISM Team convened national experts in the fields such as toxicology, risk assessment, statistics, and soil sampling. Key efforts of the ISM Team included a statistical analysis of ISM performance, considerations of unique laboratory processes and procedures, the suitability of ISM to various contamination scenarios and contaminant categories, and identifying the strengths and weaknesses of ISM.

A key feature of the ISM Team's effort was emphasizing the need to integrate systematic planning for any soil sampling approach. As with any sampling approach, ISM requires the integration of quantitative soil sampling objectives with the conceptual site model. Other topics of interest to the ISM Team included the theoretical underpinnings of ISM, the planning and sampling design process for implementing ISM, and potential regulatory challenges to use of ISM, particularly the requirements for calculating upper confidence limits specified in some regulatory jurisdictions.

The processes and equipment described here are the best available at the time this document was written. As technology advances and new equipment, instrumentation, and processes are developed, they may be included in future ISM implementations provided they meet fit data and measurement quality objectives for the site to be characterized.

Overall, members of the ISM Team have found that ISM provides reliable, reproducible sampling results and leads to better, more defensible decisions than have typically been achieved with many traditional sampling approaches. Such improvements result from the inherent attributes of ISM and the details of its implementation, including a clearer connection between sampling objectives and sampling approach. ISM works to address and overcome the sampling errors associated with soil sampling, integrates attention to detail in planning and field work, and requires attention to quality assurance/quality control measures throughout the sampling effort and not just in the laboratory. ISM also affords an economy of effort and resources. Generally, it would take dozens of discrete samples from any particular area to approach the reliability in an estimate of the mean provided by a well-designed incremental sampling approach. As a result of the advantages and improvements inherent in ISM over traditional methods, ISM is finding increased use in the field, as well as acceptance and endorsement by an increasing number of state and federal regulatory organizations.

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# ISM Applications

- ▶ Regulated sites
- ▶ Former pesticide-applied orchards
- ▶ Floodplain-impacted soils
- ▶ Stockpiled soil
- ▶ Post-soil treatment sampling
- ▶ Dredged materials



Orchard



Ball field

## ISM Applications (continued)

- ▶ “Back 40”
- ▶ Firing ranges
- ▶ Confirmatory sampling
- ▶ Background
- ▶ Other
  - Fill material
  - “Rail to trail” sites

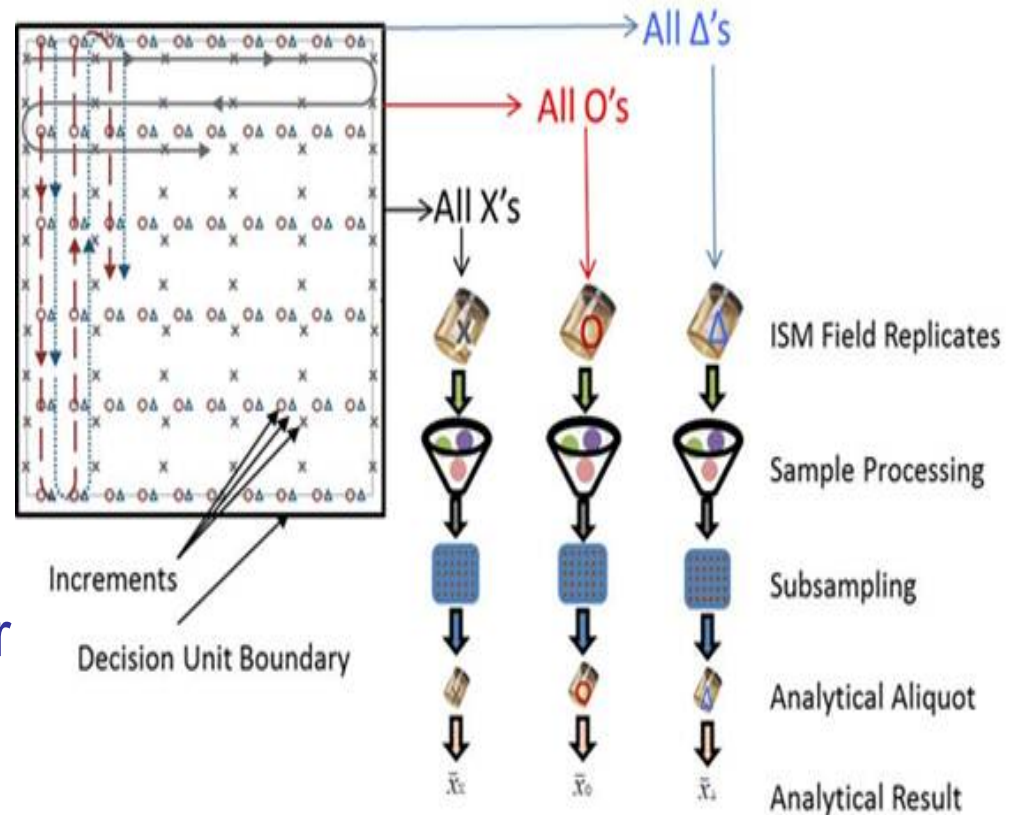


# A Cost Comparison: ISM vs. Discrete



# What Can ISM Do For Me?

- ▶ Unbiased estimate of the mean
- ▶ Improved spatial coverage
- ▶ Increased sample representativeness
- ▶ Address most common sources of sampling error
- ▶ Reduced data variability



## What to Remember about ISM

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- ▶ Calculation of a 95%UCL limited to two methods: student's t and Chebyshev
- ▶ No spatial resolution within Decision Unit

# Incremental Sampling Methodology

The primary objective of sampling is to obtain a representative sample.

