



Welcome to the
**Long-Term Monitoring
Optimization for Ground Water
Seminar**

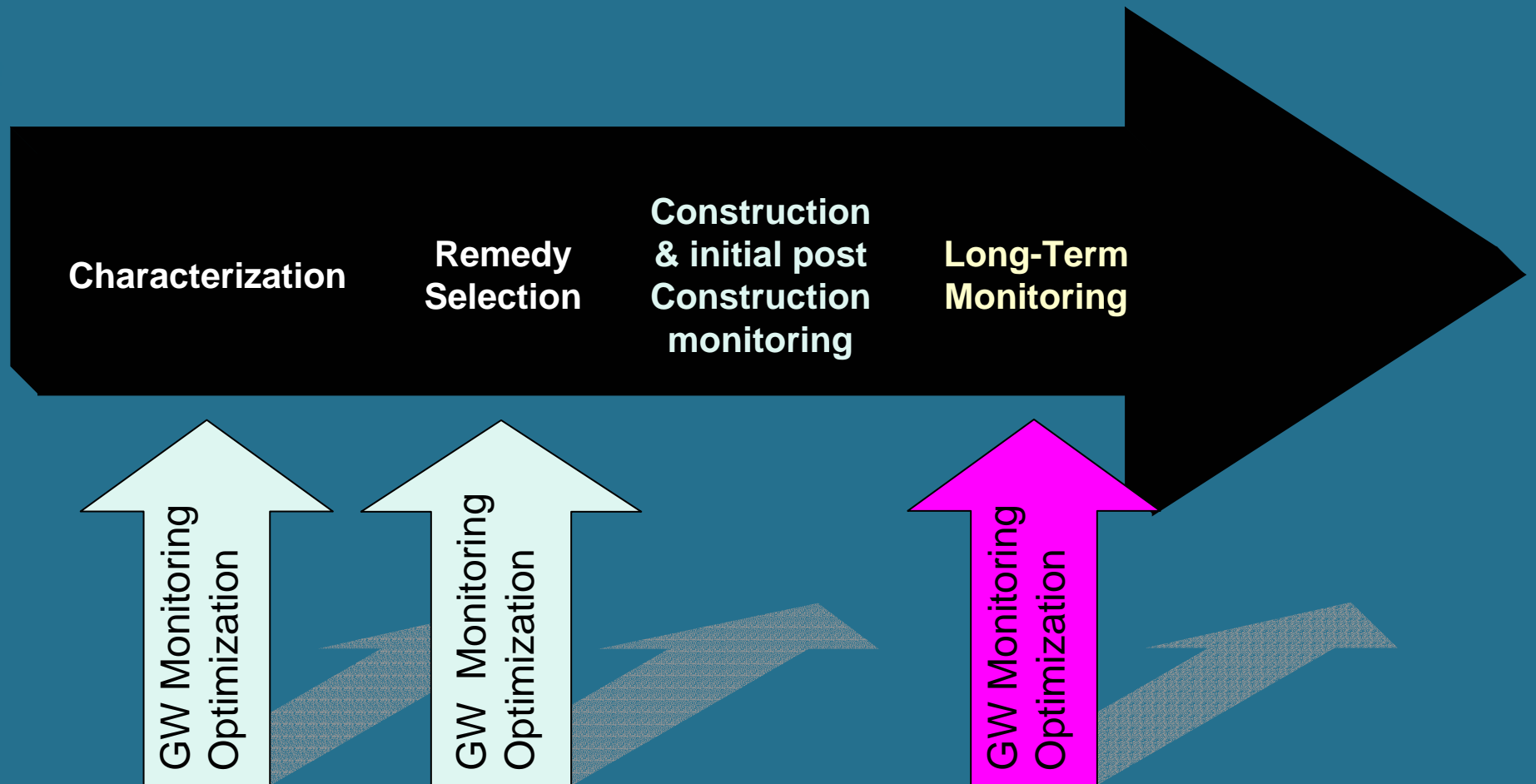
*Ellen Rubin, PhD, PE
US Environmental Protection Agency
Office of Superfund Remediation and
Technology Innovation
May 26, 2005*

LTMO

Introduction

- Purpose: Familiarize Participants with Long-Term Monitoring Approaches, Benefits, and Pitfalls
- Instructors
 - Dave Becker, PG, US Army Corps of Engineers HTRW Center of Expertise
 - Kirk Cameron, PhD, MacStat, Inc.

Ground Water Monitoring Timeline



Definitions

- Long-Term Monitoring (LTM): *“[M]onitoring conducted after some active, passive, or containment remedy has been selected and put in place, and ... used to evaluate the degree to which the remedial measure achieves its objectives”* - LTM is Critical to Remediation...
- LTM Optimization: Evaluation of, and if necessary, modification to the LTM Program to: *“improve the cost-effectiveness of the LTM effort by assuring that monitoring achieves its objectives with an appropriate level of effort.”*

What is LTMO?

- LTMO confirms monitoring program meets monitoring objectives
- Involves qualitative (professional judgment) and quantitative aspects
- Qualitative aspects include review of
 - Site conceptual model
 - Hydrogeology and contaminant distribution
 - Sampling and analytical methods
 - Data management
 - Regulatory framework/drivers
 - Sampling locations and sampling frequencies

What is LTMO (cont'd)?

- Newer 'quantitative' methods available for evaluating sampling locations and sampling frequencies
- Employ statistics and geostatistics to evaluate redundancies or deficiencies in monitoring network
- Help with the following questions
 - Am I sampling at appropriate frequencies?
 - Am I sampling in 'optimal' locations?
- Support overall monitoring network decision, but must be coupled with qualitative review

Available LTMO Methods

- Monitoring and Remediation Optimization Software (MAROS)
 - Developed by AFCEE, free software
- Parsons' 3-Tiered Monitoring Network Optimization (MNO)
 - Consulting approach, well documented
- Geostatistical/Temporal/Spatial Algorithm (GTS)
 - Developed by AFCEE, free software to-be available in summer 05
- Several advanced methods being developed by consultants

Importance of Long-Term Monitoring Optimization

- LTM is a Growing, Persistent, and Costly Obligation for Government Agencies and Private Parties
- 2004 Survey on Sampling by QED Systems
 - 44% Said Number of Sampled Wells Stayed Same. 43% Said Number Increased, Only 13% Said Number Decreased
 - Most Wells Sampled Quarterly or Semi-Annually
 - Most Sampling Estimated to Take 45 to 60+ Minutes by One Person, 30 to 60 Minutes for Two Persons

Importance of Long-Term Monitoring Optimization, Continued

- LTM May Not Provide the Right Data
 - Inadequate Amount of Data to Make Decisions, Data Gaps
 - Not All Data Used in Decisions
 - More Data Collected than Needed
- Optimization Improves Usefulness and Cost Effectiveness of Effort

What Does LTM Optimization Include?

- Evaluation of:
 - Sampling Frequency
 - Sampling Locations
 - Other Aspects
 - Analytical Program
 - Sampling Methods
 - Data Management
- Can Result in Increase or Decrease in Effort Depending on Site Conditions and Objectives
- Works Hand-in-Hand with Good Project Planning and Data Quality Objectives Process

Sites That Could Benefit From LTMO

- Improvements Possible at All Scales
- Potential Public or Ecological Exposures
- Sites with
 - Large Ground Water Plumes
 - Many Monitoring Wells
 - Large Suite of Chemical Analytical Methods
 - Perceived Problems with LTM Program
- Requires
 - Technical Expertise
 - Commitment of Resources
 - Willingness to Implement Recommendations

OSRTI LTMO Demonstration

- Project to demonstrate LTMO methods at 3 sites
- Results showed average sampling reduction of 36%
- Site managers may be hesitant to modify monitoring programs because:
 - Comfortable with current monitoring program
 - Unfamiliar with methods
 - Current monitoring requirements specified in decision documents
 - Concerned with potential for unidentified contaminants
- Lessons learned
 - Need to couple with qualitative review
 - Need to work closely with entire project team
 - Need to better train site staff in basis of LTMO methods

Results From OSRTI LTMO Demonstration - combined

Site	Original Sample Frequency (events/yr)	Optimized Sampling Frequency (percent reduction) (cost reduction/yr)
Fort Lewis	180	113 - 110 (37 -39%) (\$34,600 - \$36,500)
McClellan	34	31.5 -17 (7 - 50%) (\$300 - \$2,550)
Long Prairie	51	36 -24 (30 - 53%) (\$4,000 – 6,700)

Current OSRTI LTMO Evaluations

- OSRTI in conjunction with the Army Corps. and Parsons is in the process of conducting two LTMO evaluation for fund lead sites.
- Look for reports out this fall.

What's In Store

- Instruction on Conducting LTMO
 - 7 Steps of LTMO
 - How to Approach LTMO, Based on EPA/USACE “Roadmap”
 - Overview of available LTMO Methods
 - Discussion of Common and Available Methods
- Reviewing LTMO Evaluations
 - What if You are on the Receiving End of LTMO
- Case Studies
 - Meant to Illustrate Benefits, Pitfalls, and Approaches

Resources

- Roadmap to Long-Term Monitoring Optimization EPA 542-R-05-003
- Demonstration of Two Long-Term Groundwater Monitoring Optimization Approaches
- www.frtr.gov/optimization
- www.cluin.org/optimization

On with The Show...