

EPA Guidance on Effective Management and Reporting for Operating Pump and Treat Systems

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***Accelerating Site Closeout, Improving Performance,
and Reducing Costs through Optimization***

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Presenters

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Presentation Objective

- Introduce two new EPA fact sheets related to long-term O&M of P&T systems
 - *Elements for Effective Management of Operating Pump and Treat Systems*
 - OSWER 9355.4-27FS-A, EPA 542-R-02-009, December 2002
 - *O&M Report Template for Ground Water Remedies with Emphasis on P&T Systems*
 - OSWER 9283.1-22, EPA 542-R-04-003, Coming Soon!

Presentation Objective

- Please note that four other new EPA fact sheets will be available soon
 - *Effective Contracting Strategies for O&M of Pump and Treat Systems*
 - OSWER 9283.1-21FS, EPA 542-R-04-002, Coming Soon!
 - Presented at 11:30am on Day 2, Track C
 - *Cost-Effective Design of Pump and Treat Systems*
 - OSWER 9283.1-20FS, EPA 542-R-04-004, Coming Soon!
 - Presented at 2:00pm on Day 2, Track A
 - *Ground Water Remediation Optimization: Benefits and Approaches*
 - Presented at 8:30am on Day 3, Track C

Look for all of the fact sheets at www.cluin.org/optimization

Background

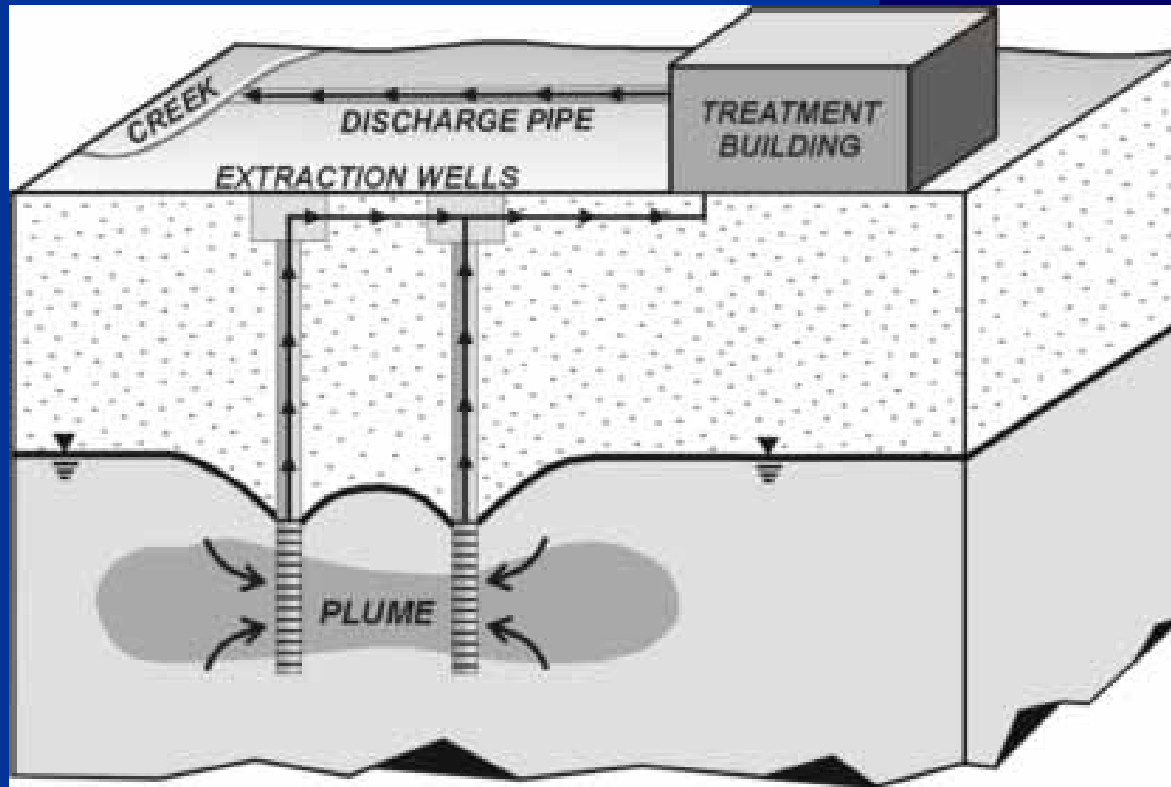
- All of these fact sheets were inspired by the results of a nationwide pilot to optimize operating Fund-lead P&T systems
 - 20 optimization evaluations (RSEs) were conducted
 - RSEs identified a number of useful practices
 - RSEs also identified over 200 opportunities for improvement
 - Over 60 related to improving or evaluating protectiveness
 - Over 60 related to cost reduction

Results suggested need for more specific guidance on O&M

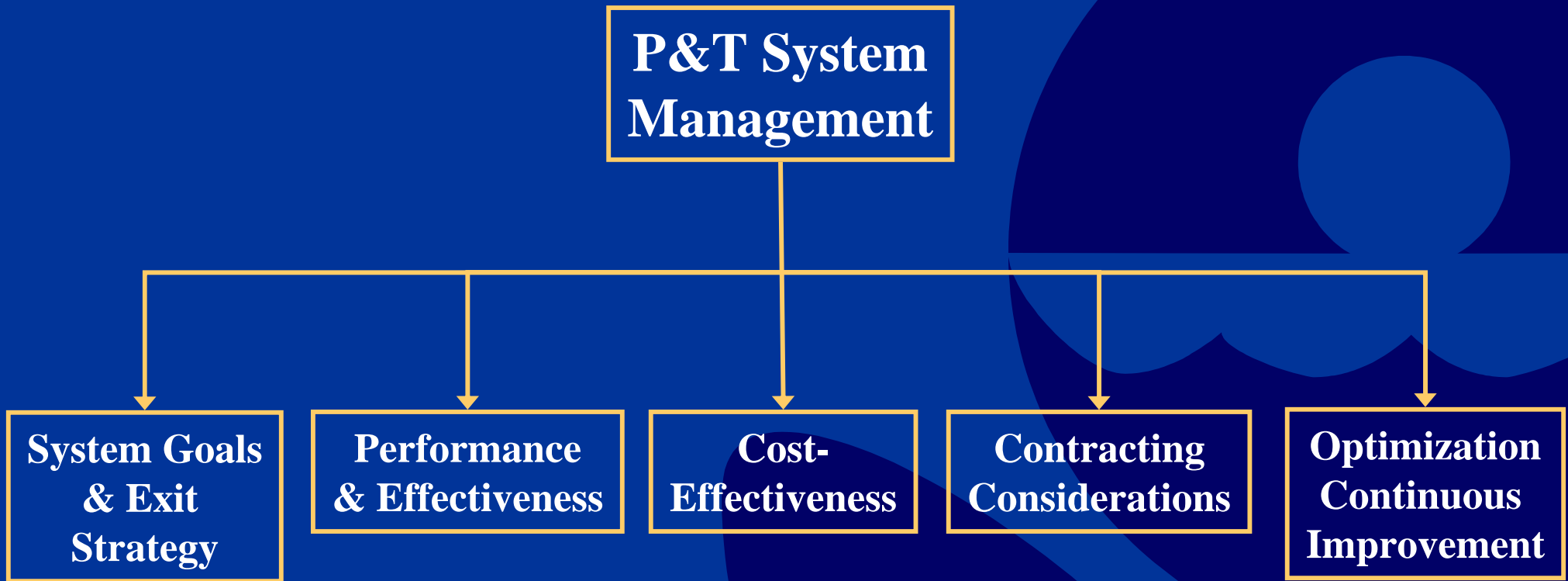
Background

- These fact sheets are intended to
 - Demonstrate the need for active management during O&M
 - Outline primary responsibilities during O&M
 - Provide general information, tools, and “rules of thumb” for addressing those responsibilities
- They are NOT intended to
 - Replace hydrogeological or engineering expertise
 - Replace the need for external or independent optimization evaluations

Elements for Effective Management of Operating P&T Systems



Elements



This fact sheet provides an overview of each topic. Other fact sheets that are under development provide additional detail.

System Goals & Exit Strategy

- P&T system goals should...
 - Be clearly stated and prioritized with an estimated time frame
 - Be appropriate relative to the site-specific conceptual model
 - Include metrics for evaluating system performance
 - Clearly indicate when some or all of the P&T system can be discontinued
 - Be achievable and revised over time as appropriate

Know where the

EXIT

is!

Evaluating Performance and Effectiveness

- Topics regarding the evaluation of subsurface include...
 - Evaluating plume capture
 - Performing/interpreting ground water monitoring
 - Evaluating extraction and injection well performance
- Topics regarding the evaluation of the treatment system include...
 - Performing/interpreting process monitoring
- Examples and exhibits include
 - Conducting a water budget analysis
 - Converging lines of evidence for capture at a hypothetical site
 - Calculating contaminant mass loading
 - Considerations for measuring water levels
 - Considerations for monitoring water quality

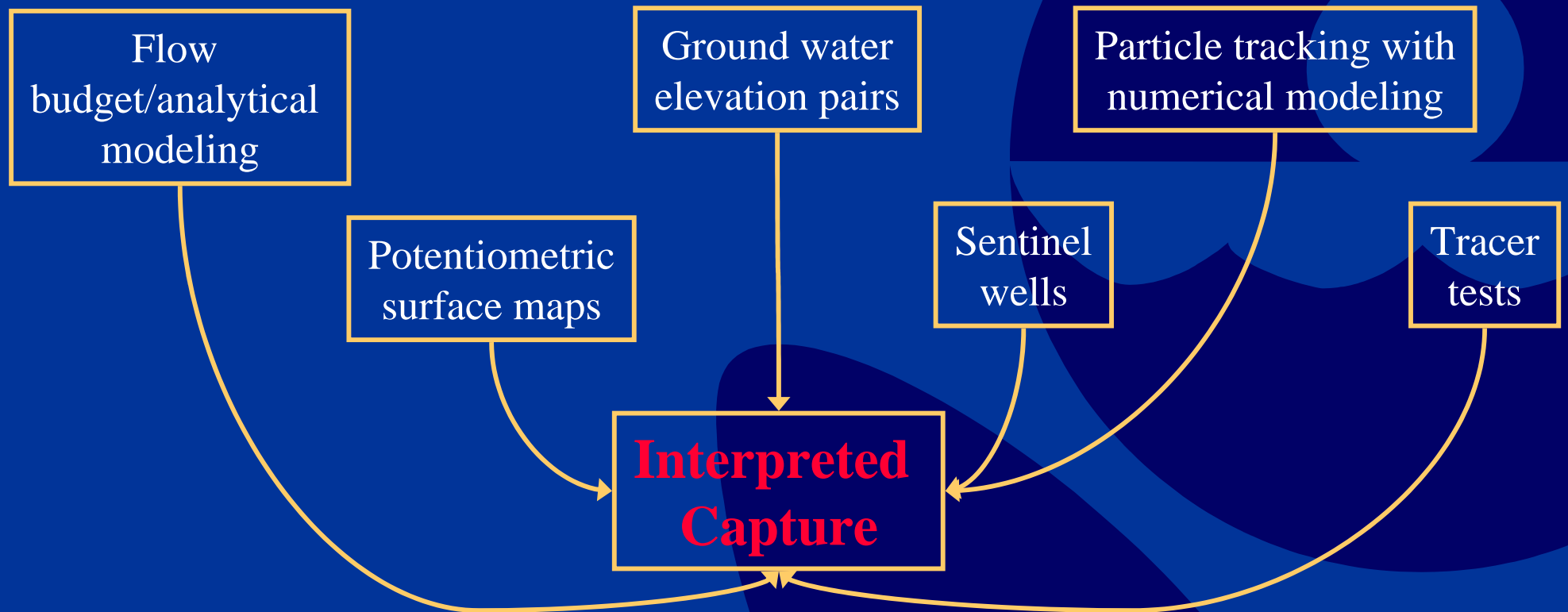
Evaluating Performance and Effectiveness: Plume Capture



Use converging lines of evidence to interpret actual capture

Look for “A Systematic Approach to Evaluation of Capture Zones at Pump and Treat Sites”, which is currently under development.

Evaluating Performance and Effectiveness: Plume Capture



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Cost-Effectiveness

- Topics include...
 - Identify significant cost items
 - Maintain and clean equipment as appropriate
 - Modify inefficient system components
 - Remove redundant or unnecessary components
 - Consider alternate discharge/disposal options
 - Eliminate excess monitoring

Cost-Effectiveness

Annual O&M Costs for a Hypothetical P&T System

Cost Category	Annual Cost	% of Total Annual Cost
Labor <ul style="list-style-type: none">● PM & reporting● O&M operator● Sampling labor	\$30,000 \$49,200 \$28,800	43%
Utilities <ul style="list-style-type: none">● Electricity, gas, sewer, etc.	\$54,000	22%
Materials <ul style="list-style-type: none">● GAC● Chemicals	\$12,000 \$15,000	11%
Chemical Analysis	\$36,000	14%
Disposal costs	\$24,000	10%
Total	\$249,000	100%

Cost-Effectiveness

- Other examples and exhibits include
 - Translating pump and motor sizes into electricity usage and cost
 - Calculating savings from replacing an oversized motor
 - Recognizing that influent concentrations may be well below design concentrations
 - Evaluating an over-designed treatment component
 - Positives and negatives for various discharge options

Contracting Considerations

- Topics include
 - Clearly establishing the responsibilities of the contractor for key items such as
 - Maintenance of site records
 - Data collection, reporting, and analysis
 - Comparing lump-sum vs. cost-reimbursable contracts
 - Planning for reductions in scope as site conditions change
 - Key items to be included in an O&M report

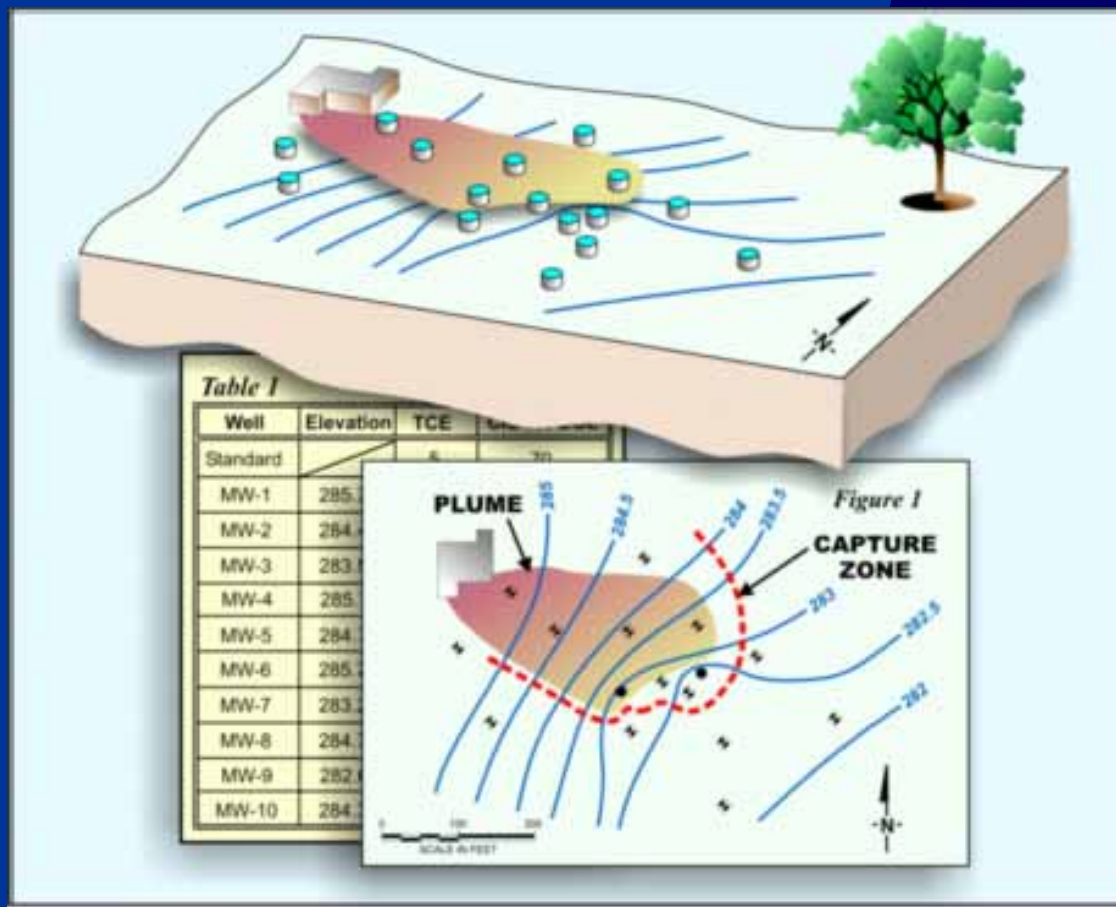
Look for the upcoming “contracting” fact sheet!

Optimization and Continuous Improvement

- Periodically evaluate goals, performance, and cost-effectiveness
- Consider value of third-party (or independent) reviews
 - An unbiased, external review
 - Expertise and experience in designing, operating, and evaluating other P&T systems
 - Knowledge and experience with alternative technologies
 - A fresh perspective on problems the site team has been addressing

Look for a new EPA fact sheet titled “Groundwater Remediation Optimization: Benefits and Approaches”, which is coming soon!

O&M Template Report for Ground Water Remedies (with Emphasis on Pump and Treat Systems)



O&M Reports

- The fact sheet serves as an O&M report template with the following sections...
 - Executive Summary
 - Introduction
 - Operations Summary
 - Subsurface Performance Summary
 - Suggested Modifications
- Fact sheet also includes approximately 20 example tables and figures

Operations Summary

- Include the following:
 - System downtime (routine vs. non-routine)
 - Process monitoring schedule and data
 - Extraction well data (flow rates, concentrations, specific capacities)
 - Current data presented alongside historic data and design parameters
 - Efficiency of primary treatment components
 - Utilities, consumables, and waste handling/disposal
 - Problems encountered (extraction and treatment system)
 - Maintenance (routine vs. non-routine)
 - And other items...

Operations Summary

Month	Influent Conc.			Effluent Conc.			Benzene Stripper – GAC (ug/L)	Stripper Efficiency (%)***
	Benzene (ug/L)	Nickel (ug/L)	Lead (ug/L)	Benzene (ug/L)*	Nickel (ug/L)	Lead (ug/L)		
Discharge Limit	5	200	50	5	200	50	5	200
1/98	1,194	29.6	25.2	ND (1)	20.8	13.1	19.2	98.39%
2/98	844	16.8	23.8	ND (1)	15.6	9.2	-	-
3/98	871	41.4	28.7	ND (1)	25.0	16.2	-	-
4/98	1,008	41.9	25.2	9.4**	29.2	19.4	15.4	98.47%

* ND (1) indicates analyte was not detected above detection limit of 1 ug/L

** Exceedance of discharge criteria due to fouled GAC. GAC has been replaced.

*** If sample between stripper and GAC is ND, the air stripper efficiency is calculated using half the detection limit

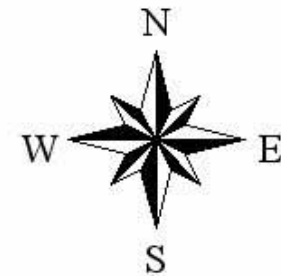
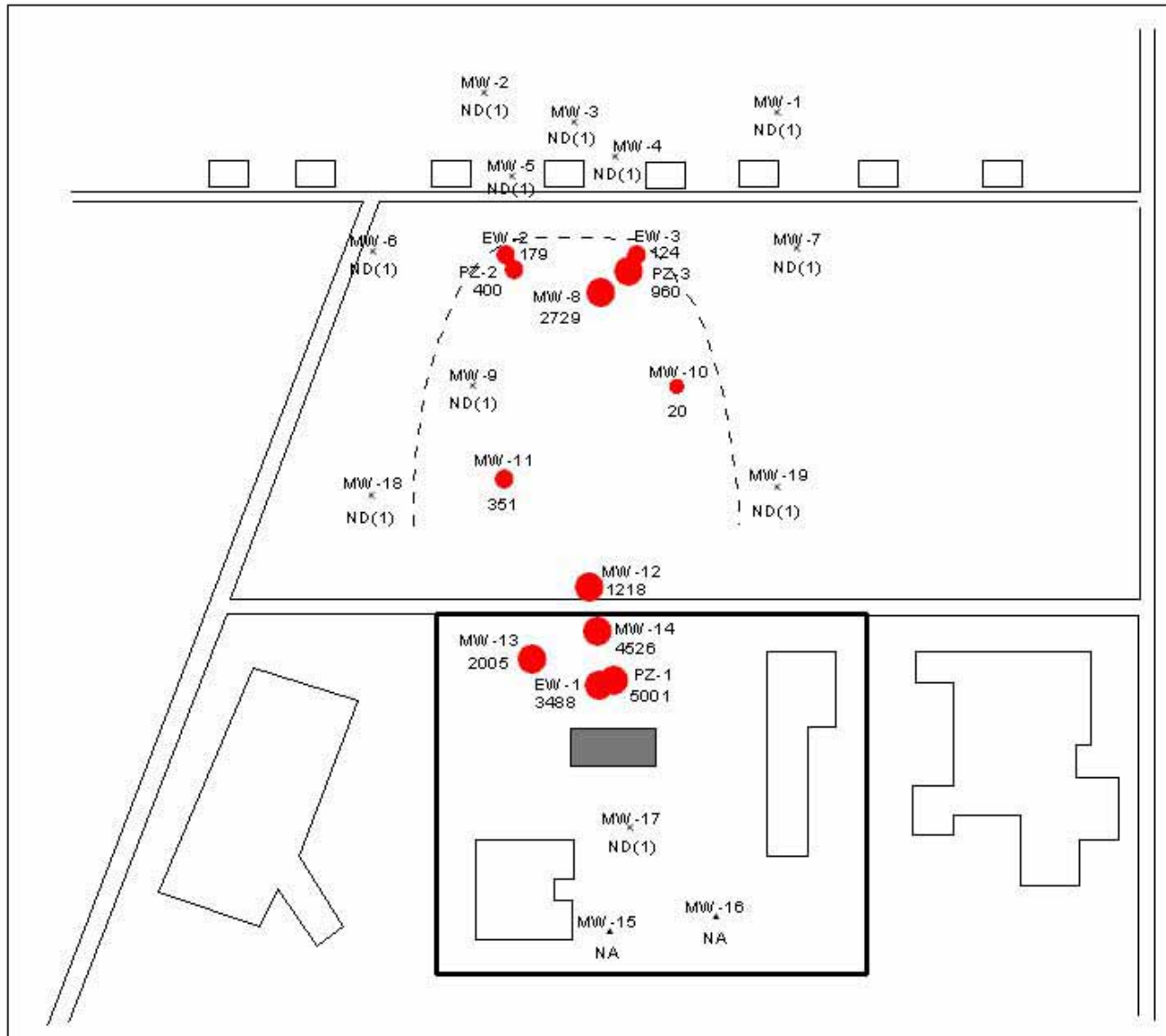
Subsurface Performance Summary

- Include the following:
 - Sampling events performed during the reporting period
 - Water level data
 - Concentration data
 - Other monitoring results (surface water, supply wells, etc.)
 - Interpretation of progress toward goals
 - Progress with respect to short-term goals (e.g., capture)
 - Progress with respect to long-term goals (e.g., aquifer restoration)
 - Gaps or inconsistencies in site conceptual model

This section might include capture zone analyses to evaluate plume capture and/or trend analyses to evaluate aquifer restoration.

Subsurface Performance Summary

Shallow Benzene Concentrations (October 2002)



LEGEND

Benzene Concentration
(MCL = 5ug/L)

- × ND (Non Detect)
- ≤ 5 ug/L
- 5 - 50 ug/L
- 50 - 500 ug/L
- > 500 ug/L
- NA (Not Analyzed)

--- Target Capture Zone

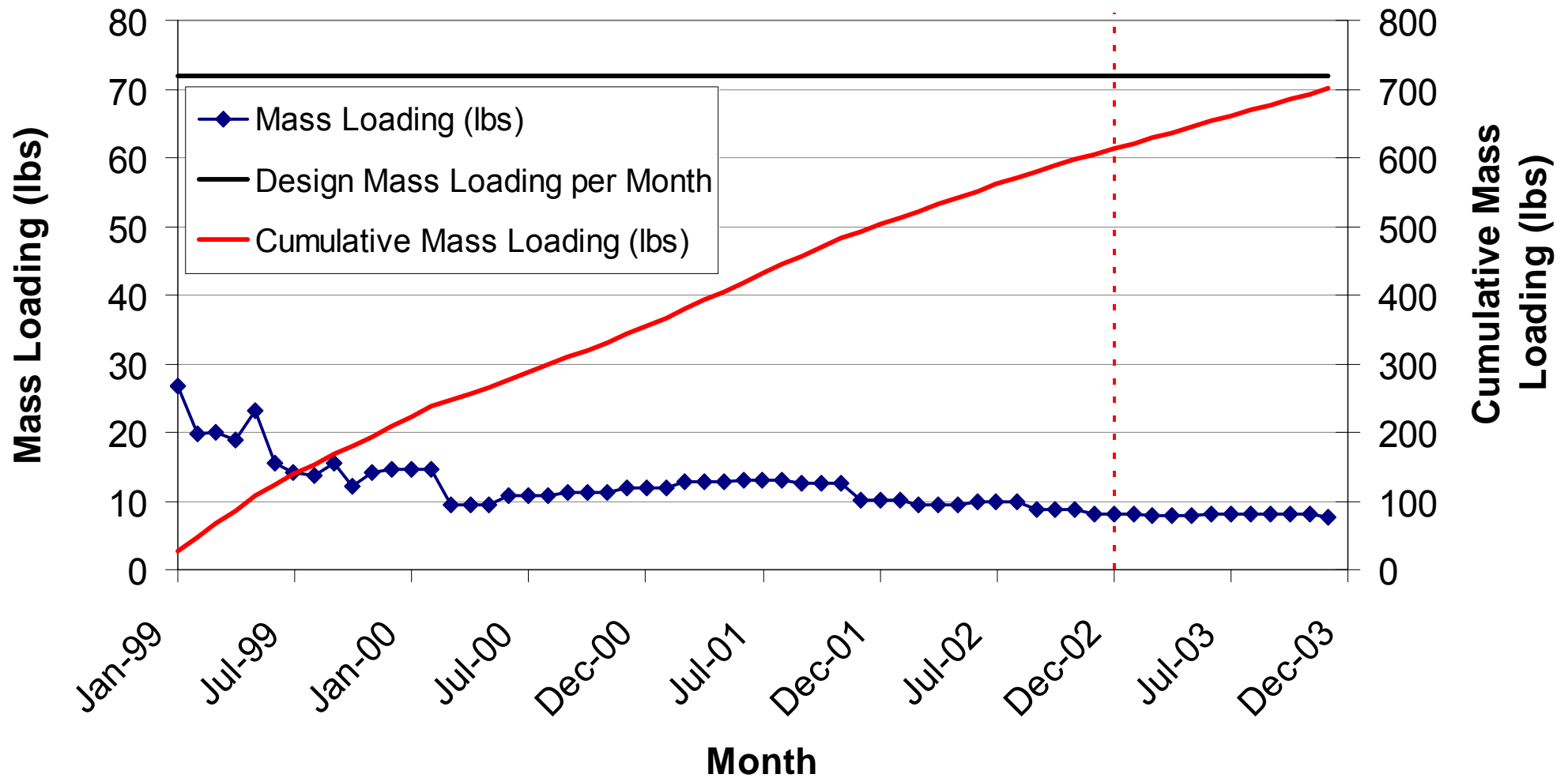
- Buildings
- ▭ Facility Boundary
- Former Lagoon

100 0 100 200 Feet



Subsurface Performance Summary

Example Figure 4. Plant Monthly Mass Loading and Cumulative Mass Loading



Concluding Remarks

- Remember... these two fact sheets and others will be available at the following web site

www.cluin.org/optimization

- Also visit

www.frtr.gov/optimization