Optimization Reviews
An Opportunity to Consider Exit Strategies

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11/09/2011
Superfund Optimization Results To Date
Based on an analysis of 52 of 100 optimized sites

- **Cost savings**
  - 83% cost savings opportunities
  - 52% cost savings opportunities > $1 million

- **Improved protectiveness**
  - 19% eliminate or confirm no ecological exposures
  - 33% eliminate or confirm no human exposures
  - 62% improve or confirm control of plume migration

Similarly positive findings for the other 48 optimized sites…

and >$350M in potential cost savings/avoidance for all 100 sites.

~45% of sites include recommendations for CSM or characterization improvement!
Perspective

- **Definition by perspective, statute, program**
  - EPA Superfund no formal definition
  - AFCEE example

- **exit strategy — n** 1. a method or plan for extricating oneself from an undesirable situation 2. a plan and timetable for withdrawal from a military engagement 3. the method by which an investor intends to cash out of an investment

  - Collins English Dictionary - Complete & Unabridged 10th Edition
How Might Exit Strategies Help in Superfund?

Figure 1: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites
The Usual Suspects

RAOs
- Short term
- Long term

CSM
- Sources and release mechanisms
- Detailed site hydrogeological model
- Contaminant fate and transport
- Current and future receptors
- Uncertainties

Actions to be taken to achieve RAOs
- Individual components
- Operation, control, monitoring

Performance metrics and decision logic
- Engineered components
- Interim milestones for short-term RAOs
- Final completion through achievement of RAOs

Contingency plans/Alternative exit strategies
- Evaluating different approaches
- Justifying alternative strategy

Federal Remediation Technologies Roundtable
Elements Potentially Applicable to Exit Strategies

Project Type
- Multiple Sites
- Single Sites

Strategy Levels
- Organizational
- Programmatic
- Site-Specific / Stakeholder
- Technical / Media
- Administrative

Strategy Gap Assessment
- What specific elements are needed from each level?

Comprehensive Exit Strategy Plan
Exit Strategies Viewed Through The Superfund Optimization Lens

- No identified data sufficiency or statistical techniques to close sites very near attainment

- Historically focused on CSM elements
  - Source identification, strength, hydrogeologic context, data consistency with CSM
  - Plume delineation and stability, concentration trends, attenuation processes/strength/speed

- Make case for data sufficiency for conclusions to date and future needs for completion

- 3 Superfund optimization examples
Well 12A

- Oil recycling/solvent processing- VOC contamination
  - Original ROD 1983, RODA 1985, ROD modification 1987
  - Remedial actions- GETS, VES, filter cake excavation
  - RSE 2001
  - State operating the groundwater treatment plant since October 2005
  - 3D visualization and site-wide optimization 2009/2010

- 2009/2010 Findings
  - GETS not capturing TCE
  - High concentration soils- shallow filter cake, deeper zones likely feeding dissolved plume
  - Important hydrogeologic features- anaerobic/aerobic conditions, areas of significant potential matrix diffusion
Well 12A exit strategy

- Articulate desired end state in 2010 RODA
  - Adequate use of robust source removal, timely transition to polishing steps
  - Reduce/eliminate need for pump and treat
  - Appropriate reliance on MNA, mass flux metrics
  - Adaptive, flexible implementation

- Define actions (spatial), metrics (temporal)
  - Shallow excavation, focused thermal footprint
  - Enhanced anaerobic bio near source dissolved phase
  - Transition to MNA, monitoring/modeling to assess RAO of MCLs at municipal well
Well 12A
Palermo Wellfield

- TCE at municipal well identified 1993
- ROD 1999
  - Wellhead air stripper treatment system (PCE, TCE)
  - SVE at upgradient dry cleaner (operated 1998-2000)
  - French drain system- shallow GW, VI
- Subsequent monitoring and 5 year reviews
  - CSIA- minimal degradation, TCE source investigation
  - Plume delineation, capture, VI?
Palermo Wellfield- Optimization and Exit Strategy

- Wellhead treatment effective, continue active remedy
  - Plume capture question remains, recommended well locations and minimal data necessary
  - Select sampling frequency reductions

- Vapor Intrusion
  - Base VI RAOs on indoor air/soil gas rather the GW depth
  - Crawlspace survey plus 2 additional focused sampling events, VI assessment/SVE effectiveness at dry cleaners

- Shallow GW
  - Surface water expression, aeration pond

- Other
  - TCE upgradient source
  - Data management, extraction rate/volume reporting, City agreement
Applied Materials

- Site characterization 1983, NPL 1987, GW ROD 1990
- The groundwater extraction and treatment system
  - 1985 and 1999 in the A zone
  - 1990-2002 the A2 zone
  - Phased out due to low COC recovery (1996-2002)
- Intermittent low level exceedences
  - 1,1,1 TCA and TCE below cleanup levels across site
  - TCA Daughter products 1,1-DCE and 1,1-DCA exceed
- Hydrogeology, primary contaminant sources, plume morphology, attenuation trends all well understood
Applied Materials Exit Strategy

- Closure clarity
  - Attainment throughout aquifer = all COCs, all wells

- MAROS- reduced monitoring frequency
  - Specific wells and frequencies

- CSM and concentration trend analysis
  - Active remediation not necessary/limited value
  - Source largely depleted, limited secondary sourcing resulting in daughter product exceedences

- Policy, statistics, data standard questions remain
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**1,1-Dichloroethane**

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Opportunities

- Integrated approaches across multiple strategy levels

- Clear framework
  - Improved framework for technical and media strategies
    - Specify data sufficiency, temporal aspects, statistics
    - Include organization, program, stakeholder, administrative elements

- Streamlined and cost effective
  - 8-10 pages with tables and figures
  - < 25K for development

- Build consensus, goal oriented, includes schedule/budget elements, measures progress for interim and final goals
  - Continuity, automate decisions
  - Opportunity to revisit at a prescribed frequency (annually?)