Time Oil/Well 12A Superfund Site
A case study of the successful transition from pump and treat to monitored natural attenuation and long-term monitoring

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Time Oil/Well 12A Superfund Site

• Paint and lacquer thinner manufacturing (1924-1964)
• Waste oil recycling (1924-1976)
• Oil canning (1976-1991)
• Six primary COCs in soil and groundwater
  • 1,1,2,2-Tetrachloroethane (PCA)
  • Tetrachloroethene (PCE)
  • Trichloroethene (TCE)
  • cis- and trans-1,2-dichloroethene (DCE)
  • Vinyl Chloride (VC)
• TCE contamination impacting the City of Tacoma municipal supply Well 12A
2009 Focused Feasibility Study and ROD Amendment #2

- 2008 5-Year Review: Remedy not meeting objectives
- 2009 ROD Amendment #2 established a 90% mass discharge reduction goal for additional source treatment
- First known use of contaminant mass discharge reduction as a compliance goal in a ROD
Remedial Action Objectives - Tiers of Compliance

• **Tier 1:** Reduce risk from contaminated surface soils and achieve a contaminant mass discharge reduction of at least 90% from the high concentration source area near the Time Oil building to the dissolved-phase contaminant plume.
  • Remedy will be considered operational and functional.
  • O&M of Site will be turned over to the State of Washington.

• **Tier 2:** Achieve chemical-specific applicable or relevant and appropriate requirements (ARARs) measured at proposed alternate points of compliance.

• **Tier 3:** Determine if ARARs can be achieved throughout the plume using monitored natural attenuation.
Remediation Summary, 2011-2016

- 2,130 tons of contaminated shallow soil and filter cake removed
- Two USTs removed
- Building demolition
- ISTR of ~400 lbs. COCs and >22,000 lbs. non-target petroleum compounds
- Bioremediation of high-concentration GW plume
- Thermally enhanced bioremediation of two DNAPL areas

- Mass Discharge Reduction
  - 87.5% total COCs
  - 99% parent compounds
  - 67% degradation compounds
- Five of six COCs reduced to below MCLs in GETS influent
- Intent of 90% MD reduction RAO met
- GETS shutdown
• Analytical modeling approach
• Evaluate the aquifer attenuation capacity between the source and supply well
• Determine if the on-site P&T system is required to protect the supply well
• Modeling demonstrated the mass discharge reduction was sufficient to protect Well 12A without active source control (i.e., GETS)
Well 12A Influent TCE

Air Stripping System Online
July 1983

Start GETS Operations
November 1988

SVE

GETS Operations

Interim RA

Baseline Mass Discharge Evaluation

Post-RA Mass Discharge Evaluation

Fall 2015 Pumping During RA

Fall 2018 Pumping Post-RA
Current Status and Next Steps

• Long-term monitoring responsibility transferred to the State of Washington
• GETS permanently shutdown and is being decommissioned
• EPA to finalize O&F determination following GETS decommissioning
Critical Success Factors and Lessons Learned

- Adaptive management implemented throughout project lifecycle
- Communication and stakeholder engagement and management
- Mass discharge-based remedial objectives
Adaptive Management

- Flexible and adaptive approach to remedial investigation, design, implementation, and monitoring
- Systematic process that requires rigorous planning
- Acknowledge and manage uncertainty and risk
- Robust living conceptual site model
- Flexibility in the selected remedy
  - Interim ROD
  - Interim objectives with defined transition points
  - Technology toolbox approach
- Performance-based SOW
- Cost-reimbursable contract
- Embraced by project team
Communication and Stakeholder Engagement

• The team makes the project
• Weekly project calls with primary stakeholders
  • CDM Smith, USACE, EPA, Ecology
• Regular communication with other stakeholders
  • City of Tacoma
  • Property owners
  • Other interested parties
• Planning
  • Kickoff meeting with primary stakeholders
    • Getting buy in on the mass discharge RAO and adaptive management approach
    • Critical Success Factors
    • Risk Workshop
Mass Discharge Applications

• Common Site Characterization and CSM Applications
  • Quantify source strength
  • Identify high-priority areas or stratigraphic units for treatment
  • Improve management decisions regarding site prioritization or remedial design and implementation
  • Estimate source strength reduction needed to transition to other technologies

Mass Discharge-Based Remedial Objective Lessons Learned

- Mass discharge requires a different way of thinking from concentration-based goals, e.g., MCLs
- Methodology, measurement location, and timing are all site-specific
- Must be robust, defensible, repeatable within the intrinsic variability of the measurement
- Need buy in on baseline measurement and post-RA methodology before starting the RA
- Planning for change
- Consider how the makeup of COCs will change through RA implementation
- Consider the MD reduction objective in terms of concentration

90% $\text{M}_d$ reduction objective required GETS influent concentrations below MCLs for some compounds
Questions?

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