Enhanced Reductive Dechlorination (ERD) Treatment of Large-Scale Chlorinated Solvent Site: Evaluation of Substrate Options, Unit Costs, and Performance Data

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Background/Objectives. The cost of injectable substrate to promote ERD can be the largest expense in large-scale ERD projects. It doesn't have to be. This presentation examines the cost of ERD and effectiveness of different substrates, some if which can be very low cost compared to common commercially available substrates. Site restoration of a chlorinated solvent plume site in the Seattle area has used thermal treatment in the source area and ERD treatment of the larger plume using both fructose and soybean oil and lactose.

Approach/Activities. Regarding ERD treatment using different substrates, performance data indicate similar effectiveness but significant cost differences in implementation. Key metrics include:

1. Longevity of substrate effectiveness and frequency of injection
2. Radius of influence from injection treatment wells
3. Performance: % reductions observed in treatment zones and in downgradient wells
4. Labor and equipment cost to inject
5. Substrate cost: waste sugars versus commercially available substrate formulations
6. Shipping cost, mixing cost
7. Monitoring and reporting cost as proportion of remedial action costs
8. Unit costs for treatment ($/cubic yard of aquifer [soil/groundwater] treated)
9. Evaluation of concentrations trends in downgradient monitoring wells

Results/Lessons Learned. Common unit cost evaluations derived from the available literature (e.g., $/ volume treated) may be difficult to compare because site-specific conditions can be significantly influence the costs, such as depth of plume treatment and related drilling costs. The unit cost data in this presentation are all derived from the same site hence the relative comparisons presented herein are expected to be widely applicable. Evaluation of the factors above and full costs from this specific site indicates a 3:1 cost versus performance advantage using fructose. Other design considerations come into play when substrate costs are low; excess substrate can be used to drive reactions to lower concentrations levels. The data also demonstrate the need for careful planning and consideration of life-cycle monitoring costs.