Detailed Structure in Large Dilute Plumes - Actionable Intel From the Subsurface

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We now have numerous high-resolution datasets that characterize contaminant mass transport and storage zones in large, dilute plumes. The patterns that have emerged provide new focal points for remedy strategists that promise to lower costs for large-plume response and to improve reliability of large-plume remedies. Among the important lessons:

- Many of our longstanding simplifying assumptions about aquifers - concepts accepted as things we 'know'- turn out to be unfounded and, in some cases, counter-productive.
- Groundwater and contaminant transport follow transmissive zones that comprise less than 10 percent of the typical aquifer volume.
- Diffusive interchange between transmissive and stagnant regions place a large amount of contaminant mass into storage, which sometimes causes contaminant 'tailing' and rebound during restoration.
- The aquifer structure, its 'matrix geometry,' controls the nature and importance of diffusive interchange on contaminant behavior.

For aquifers with favorable matrix geometries, contaminant mass can migrate into lower-permeability storage zones without causing significant tailing or rebound. In these cases, directed groundwater recirculation may be a successful strategy to reach remedial goals. Reese AFB is one such example that will be discussed.

For aquifers with unfavorable matrix geometries, contaminant mass that reaches lower-permeability zones may require some amount of treatment or enhanced sequestration to avoid tailing or rebound.

As the base of data from higher-resolution characterization expands, our ability to predict contaminant transport behavior and responses to remedial efforts will improve dramatically.