



## 11 Case Studies

Three detailed case studies are presented in this chapter. In addition to these detailed case studies, a selection of other relevant case studies are summarized in the [Case Study Matrix](#). The Case Study Matrix is divided into case studies that illustrate investigative tools and those that illustrate selected remedial technologies applied within the last 10 years or so. The selection of these case studies was not based on a particular vendor product or service. Also, these case studies represent a snapshot of applied solutions, but are not representative of all potential technologies or strategies that have been applied.

For fractured rock the remedial technologies selected may be driven by the degree of back-diffusion from matrix porosity and the physical characteristics and particular hydraulics of the site. The remedial strategies represented in the Case Study Matrix include approaches such as:

- push-pull (extract, amend, and reinject)
- gravity injection
- slurry injection/fracturing
- permeable reactive barrier
- recirculation.

When the list of technologies used is differentiated by rock types, the distribution changes somewhat. Thermal technologies are frequently selected for treatment of sedimentary rock but are seldom selected for crystalline (igneous and metamorphic) rocks. ISCO and bioremediation are frequently selected for treatment of crystalline rocks.

Note that successful results are reported at many sites where limited characterization was performed and where the monitoring well networks may also be limited. For fractured rock, characterization to understand the rock types present and the architecture of fracture networks (particularly which fractures play a larger role in the hydraulics or fate and transport of contaminants) is critical for successful remediation. A complicated and expensive characterization is not always necessary, but for each site there is an appropriate level of characterization that supports the following decisions:

- whether the CSM is sufficiently robust to proceed to remedy strategy selection
- which remedial strategy to use
- which design basis and detailed design elements (including performance assessment details) to use to reach site-specific remedial goals and objectives