EXECUTIVE SUMMARY

The Source Recovery System (SRS) at Hill AFB's Operable Unit 2 (OU 2) has been in operation since 1993. It uses phase separation and steam stripping to pretreat groundwater contaminated with chlorinated solvents, mainly trichloroethylene (TCE). Some operational problems have developed, which tend to be exacerbated by surfactant-enhanced aquifer remediation (SEAR). After the SRS was designed and built, SEAR was evaluated at OU 2 and was found to be effective; it is being implemented as a remedial action. SEAR technology involves both surfactant floods and partitioning interwell tracer tests (PITT), which generate effluents that can tax the SRS' processes. The purpose of this engineering evaluation is to propose retrofits to address these operational issues. Table ES-1 summarizes engineering solutions discussed in this report and their approximated cost.

This report starts with an examination of the future scope of SEAR at OU 2 to help put the proposed retrofits in perspective. In future surfactant floods, a polymer will probably be used. It will slightly increase the viscosity of the water processed by the SRS. This should not significantly affect the SRS's performance. A simple bench scale test is recommended to confirm the polymer's behavior at steam stripper temperatures.

Recovery and Reuse of Chemicals

Approximately $1 million in remedial fluids probably will be used at OU 2 over the next three years; most of that expense is for surfactant. Substantial savings could be achieved by recovering some of the surfactant from the steam stripper underflow, using micellar-enhanced ultrafiltration (MEUF). This concept should be investigated further.

Sediment Control

The injection and extraction operations during SEAR tend to mobilize additional sediments from the subsurface. Coarse material is intercepted by a Y-strainer in the DNAPL (dense, nonaqueous phase liquid) lines. This strainer clogs frequently; cleaning it is laborious and sometimes has to be repeated several times. We recommend replacing this Y-strainer with a basket strainer, which would have a much larger solids retention capacity and be much easier to clean.

Fine sediment in the aqueous phase tends to accumulate on the plates of the steam stripper preheater (a heat exchanger) and in the stripper column itself. As a result, the performance of the steam stripper system degrades until preheater and column must be dismantled and cleaned, another laborious undertaking. The possibility of filtering out the sediment before it enters the steam stripper was evaluated. The total suspended solids (TSS) content of the stripper feed water was measured. The measurement indicates that approximately eight pounds per day of sediment would have to be intercepted. Filtering such a large amount of solids does not appear practical with a conventional water filter. Since only one TSS sample was taken, we recommend confirmatory sampling.

Surfactant/Antifoam Management

During surfactant floods, antifoam is added to control foaming in the stripper. There are problems feeding antifoam and acid into the stripper feed water. We recommend a bottom-mounted pump and mixer for the antifoam injection, and a more powerful, top-mounted acid feed pump.

IPA Processing

Steam stripper vapors are condensed in a plate heat exchanger cooled by a glycol loop, which releases heat to the atmosphere via an outdoor, air-cooled heat exchanger. In warm weather, this system has insufficient heat transfer capacity, especially when the vapors are rich in isopropyl alcohol (IPA), as is the case during a surfactant flood. As a result, the temperature of the glycol in the closed loop rises and the glycol pumps tend to cavitate, which interrupts the glycol flow, causing failure of the condenser. This in turn causes large amounts of