Section 6

Conceptual Site Model

The data collected from the GWP site have been evaluated to understand how PCE releases have affected ground water; for identifying where releases have occurred (sources); for predicting how the contamination behaves in the system (potential migration pathways); and whether the concentrations are increasing over time. These interpretations of PCE at the site comprise the CSM. The CSM describes the general nature and extent of the plume, and identifies potential exposure pathways for evaluating risks to human health and the environment. The model is an important tool also in assisting with identifying plausible remedial alternatives. **Figure 6-1** depicts the CSM for the site.

EPA has determined that PCE was released at the following locations:

1. Near the intersection of East Hadley Avenue and North Walnut Street (along the former airport runway and the former arroyo parallel to and south of the former airport runway).
2. At the DACTD maintenance facility on East Griggs Avenue.
3. At the former National Guard Armory on East Hadley Avenue.

The use or discharge of PCE at these locations resulted in the release of PCE, which subsequently migrated into the unsaturated zone and to the ground water. A specific method of release or discharge of PCE at these locations is not known. Based on the higher relative concentrations of PCE in soil vapor and ground water, the most significant release(s) of PCE probably occurred at the DACTD maintenance facility.

The primary migration pathways for contamination originating from the likely source areas consists of transport through the unsaturated zone in the vapor phase and in the dissolved phase within water that migrating towards the ground water table. PCE could have migrated in the subsurface via infiltration, soil vapor diffusion, and/or as a DNAPL. The absence of elevated detections of PCE in ground water and soil at any of the locations suggest that DNAPL or residual phase liquids are not present or no longer present. If present, these materials are bound up within the soil matrix of the unsaturated zone with only limited potential to provide low levels of PCE to infiltrating liquids, soil moisture and soil vapor.

The current migration of PCE to ground water is likely the result of induced infiltration and vapor diffusion. It is possible that dissolved PCE occurring in leachate from precipitation or storm water in the former arroyo located north of the DACTD maintenance facility could have migrated to the ground water over a period of many years. Infiltration of precipitation through the unsaturated zone can transport contamination to the ground water, however, the low precipitation in Las Cruces indicates that infiltration of contaminated water could have originated from, or been accelerated by, leaking underground pipes (e.g. sanitary sewers), irrigation within the parks, or unlined discharge structures (sumps etc). Improperly disposed fluids containing PCE, driven by further disposal of everyday fluids or process water, could have enhanced or induced infiltration of PCE into the soil and possibly to the ground water. In a similar manner, irrigation water, infiltrating through areas of PCE contamination, could have enhanced or induced infiltration of PCE into the soil and possibly to the ground water. Localized pumping from CLC municipal supply wells has facilitated transport of PCE horizontally and across the site and vertically into deeper parts of the aquifer.

Soil vapor migration via air diffusion is a significant transport mechanism that may explain the distribution of PCE under broad areas of the site in the unsaturated soil. Diffusion occurs in response to a concentration gradient between the source and the surrounding area. PCE in soil vapor that comes into contact with the ground water table can theoretically partition into ground water based on Henry's Law, providing a means for contamination of ground water from soil vapor. With the low concentrations in soil vapor and ground water at the site, PCE can partition from soil vapor to ground water, or from ground water into overlying soil vapor depending on localized concentration gradients. The Henry's Law constant for a chemical is most applicable at the interface between water and air, so there is some uncertainty about the primary direction of transport. However, based on the relatively uniform and low concentrations of PCE present in soil vapor throughout the soil column, it is unlikely that PCE in soil vapor presents a significant ongoing source of contamination to ground water.

VOCs in soil vapor will migrate and spread out in all directions by vapor diffusion. Therefore, air diffusion can move a volatile compound such as PCE towards the soil surface until it reaches a zone of influence of the building/residence. At that zone of influence, convective air movement within the soil column transports the vapors through cracks between the foundation and the basement slab floor. This convective sweep effect is induced by a negative pressure within the structure caused by a combination of wind effects and stack effects due to building heating and mechanical ventilation. Vapor intrusion is an important exposure pathway, because the concentration in indoor air resulting from VOC intrusion is related to this pressure-driven air flow, rather than simple air diffusion.

The fate and transport, routes of contaminant migration, and potential exposure pathways are discussed in **Section 5** of this report. The identification of potential receptors along these migration pathways and the risk to these potential receptors are discussed in the risk assessment described in **Section 7** of this report.