

EXECUTIVE SUMMARY

This Baseline Risk Assessment is part of the Remedial Investigation/Feasibility Study (RI/FS) at Hill Air Force Base (AFB) Operable Unit 1 (OU 1). The base is listed as a National Priority List (NPL) site. In April 1991, a Federal Facility Agreement was signed by Hill AFB, EPA, and the Utah Department of Health (now the Department of Environmental Quality). The purpose of the agreement is to establish a framework and schedule for developing, implementing, and monitoring appropriate remedial actions at Hill AFB in accordance with the National Contingency Plan. The objective of this risk assessment is to assess the magnitude and probability of current and future public health and environmental threats posed by chemical contamination identified during the RI, and other earlier investigations at OU 1. The risk estimates will be used in evaluating potential remedial alternatives during the FS.

Operable Unit 1 consists of Landfills 3 and 4, Chemical Disposal Pits 1 and 2, and Fire Training Area 1 (collectively called the disposal areas), and the Hill AFB Golf Course. Most of the area is flat and grassy with few buildings in the vicinity. Landfill 3 was operated as a general refuse landfill from 1947 through 1967. Materials dumped and burned at Landfill 3 included large quantities of unidentified chemicals, industrial sludge, waste solvents, and residues from solvent cleaning operations. Landfill 4 was operated as a trench and fill sanitary landfill from 1967 to 1973. Landfill 4 received domestic refuse and industrial waste consisting of small amounts of drying bed sludge, sulfuric acid, chromic acid, and methyl ethyl ketone. Chemical Disposal Pits 1 and 2 were used for disposal of liquid wastes (principally petroleum hydrocarbons and spent solvents) from 1954 to 1973. At Fire Training Area 1, large quantities of jet fuel, oil, and combustible waste chemicals were used during training exercises from 1958 to 1973. The golf course is not a waste disposal area, but is included as part of OU 1 because of the potential hydraulic connection with the disposal areas.

Operable Unit 1 is underlain by a shallow aquifer about 20 feet below the ground surface in which groundwater flows to the north. The aquifer has a low yield with existing dewatering wells pumping water at rates of less than 1 gpm. Some of the groundwater discharges in the form of springs and seeps on the hillside and in the Weber Valley, both north of the disposal areas. Approximately 400 and 600 feet below the base of the shallow aquifer, respectively, are the Sunset and Delta Aquifers. These aquifers yield high quality water and the Delta Aquifer is used by the local municipal water district.

There is groundwater contamination in the shallow aquifer beneath the disposal areas at OU 1. Parts-per-million concentrations of 1,2-dichloroethene (DCE), trichloroethene, 1,1,1-trichloroethane, vinyl chloride, toluene, xylenes, 1,2-dichlorobenzene, and 1,4-dichlorobenzene have been detected. Also present are arsenic, chromium, and floating product (jet fuel, gasoline, and diesel). 1,2-DCE has also been detected in concentrations as high as 240 $\mu\text{g/L}$ in the shallow aquifer (in springs and monitoring wells) north of Hill AFB in the community of South Weber. Soil contamination generally increases with depth down to the shallow aquifer.

Indicator Chemicals. Although there are numerous compounds present at OU 1, some of them dominate the health and ecological risks. There were 27 indicator chemicals selected, although health risks are dominated by vinyl chloride, arsenic, and 1,2-dichloroethene, and in some cases trichloroethene. Arsenic and chromium are the primary chemicals of potential concern for ecological risk.

Exposure Assessment. Two exposure pathways that may be currently complete at OU 1 are: (1) exposure to chromium in springs used for watering livestock, and (2) exposure to contaminated soil gas assuming it migrates into basements of houses. No exposure pathways involving groundwater are currently thought to be complete. Future potential exposure pathways considered as possibly significant would involve domestic use of groundwater from shallow and deep aquifers, exposure of construction workers to soil contaminants, and exposure to contaminated soil gas if it migrates into the basements of houses. The exposures resulting from these pathways were estimated quantitatively when possible and qualitatively for scenarios involving a large degree of uncertainty.

Human Risk Characterization. There are no significant health threats associated with currently complete exposure scenarios. If the shallow groundwater beneath the source areas is used for drinking water and showering in the future, both the resulting cancer risks and noncarcinogenic health threats would be greater than permitted by the National Contingency Plan (NCP) with cancer risks of about 10^{-2} and hazard indices ranging from 10 to 100. Use of the shallow groundwater beneath OU 1 is the only scenario which would clearly pose a significant health risk. There is a borderline potential for significant health risks to be associated with exposure to contaminants in the shallow groundwater off base in the Weber River Valley with the cancer risk estimated to be slightly greater than 10^{-6} and the hazard index estimated to be slightly less than 1. A second scenario with a borderline potential for significant risks is the exposure of construction workers to contaminated soil, as the maximum cancer risk estimate was 3×10^{-6} (the maximum hazard index estimate was only 4×10^{-5}). There is also a borderline potential for significant health risks associated with the use of shallow groundwater on base for agricultural purposes, with a hazard index of 6 and a cancer risk of 1×10^{-3} . While these values would normally label this scenario as having a clearly significant risk, this scenario (as well as the construction worker scenario) have unusually large uncertainties that makes it difficult to classify the significance of the risks. Health risks due to potential soil gas exposure are not significant for the current exposure pathway, but may become significant based on a qualitative evaluation of future land-use scenarios.

Ecological Risk Characterization. The doses of the main contaminants of environmental concern (arsenic and chromium) to alfalfa (or similar crops) and cows are below doses thought to have an effect on these receptors. While other types of vegetation and domestic animals are found in the area, cattle and alfalfa were considered representative species for risk calculations that would provide a reasonable indication of potential hazards to agriculture. Non-domestic plants and animals are not expected to be adversely affected by the contaminants from OU 1 because there is very little potential for exposure.

Uncertainties. The total uncertainty associated with a risk estimate is the combination of the uncertainties associated with the exposure estimates and the uncertainties in the toxicity evaluation. The most important uncertainties associated with the toxicity evaluation are the absence of a quantitative dose-response relationship for developmental and reproductive effects, and the absence of slope factors and reference doses for some indicator chemicals. The dose from dermal exposure through showering is another source of uncertainty; it is not known if this route of exposure is as important as inhalation and oral exposure for groundwater, or if it is insignificant. Certain exposures have not been evaluated due to a lack of information. The most important of these exposures is current and future surface soil ingestion. This exposure cannot be evaluated because there are inadequate surface soil data with which to characterize this pathway in certain areas of the site. The potential for contaminants to migrate down to the Sunset Aquifer in the Weber River Valley was not evaluated quantitatively due to the limited information about the

hydrogeology of this area. Risks from petroleum mixtures, including jet fuel, diesel, and gasoline, were not explicitly addressed in this risk assessment, however, they contribute only marginally to the total risks. Quantitative evaluations were possible for the most toxic and prevalent compounds at OU 1. For these evaluations, this risk assessment is expected to be conservative, and the actual risks are expected to be less than those calculated.