

6.0 UNCERTAINTIES

The major uncertainty in this analysis is the actual exposure that people will experience. Because many abandoned uranium mines are on federal lands, the most likely exposure scenario is recreational use, but the true nature and extent of the recreational use is unknown. Exceptions to this are Native Americans who live around the uranium mines and personnel who may work around the sites. In addition, the number of people exposed would depend on the number of mines that have been reclaimed. Some mines have been reclaimed, but the total number is unknown. In the 1983 EPA study (U.S. EPA 1983b), the authors noted that many of the mines from the 1950s and 1960s had not been reclaimed at that time. Survey work done by Otten for EPA (1998) found that in many uranium-producing states, perhaps half of the mines or more had been reclaimed. No other survey has been conducted since that time. In the 1970s, surveys identified hundreds of potential buildings constructed from what was believed to have been uranium mining-related material. However, little is known about the extent of building contamination or the level of contamination in the building materials, or whether they remain or are occupied.

Another uncertainty is the true effect uranium mines have on the ground water and the subsequent use of the water. In many parts of the Southwest, where many of the mines are located, the primary sources of drinking water are deep-lying aquifers, so shallow open-pit or underground mines may not contaminate the water because of the limited infiltration. Furthermore, since uranium mines are in mineralized areas, it can be difficult to differentiate between a groundwater problem caused by a uranium mine and naturally occurring uranium. In other instances, in areas with surface water flow, such as the Ross-Adams Mine in Alaska, or Orphan Mine in Arizona (see U.S. EPA 2006a), a local source of drinking water may be contaminated by water flowing through uranium mine waste or the mine itself, and serve as a possible ingestion pathway for radiation exposure.

The other major uncertainty involves the concentrations of contaminants. The primary radiological contaminant of concern is Ra-226, which would contribute the greatest risk—from external exposure—to the occasional recreationalist. Uranium may also be a contaminant of concern, especially if it can migrate to a drinking-water source where its chemical toxicity becomes the health hazard. There is information that can be used to bound the potential exposures to both of these radionuclides, but the concentrations vary within a site and between the true overburden and amount of protore at a specific mining location. Arsenic, a carcinogen, has been shown to be associated with uranium mine wastes and can reach high levels at mine sites, but arsenic concentrations can be highly variable. At some sites, the risk from arsenic may dominate the radiological risk, and other metals may also contribute some uncertain level of hazard. Since this analysis was done on a generic, scoping basis, site-specific analyses would remove much of the uncertainties encountered here.