Tenmile, Blue Hills Road, and White Mesa Mill would be the sites with the highest potential for affecting cultural resources. DOE would conduct Class III cultural resource surveys as necessary to identify the precise numbers and types of cultural sites that could be present at the potential borrow sites, and would work with BLM (if the area were on land managed by BLM), the State Historic Preservation Officer, affected Native American tribes, and the Advisory Council on Historic Preservation to determine appropriate mitigation measures for affected sites if cultural resources were found.

Only two sites, LeGrand Johnson and Papoose Quarry, would not likely have federally listed threatened and endangered species occurring on or near the site. Appendix A1, "Biological Assessment," discusses potential effects at these locations in more detail. If it is determined that species are present and could be adversely affected, DOE, in consultation with the USF&WS, BLM, and UDWR, would implement mitigation measures. Species that could be affected are discussed in Sections 4.1.7, 4.2.7, 4.3.7 and 4.4.7. Surveys and investigations would not be undertaken for existing commercial sites.

Potential impacts to plants and wildlife would be limited to terrestrial ecological resources during the time the borrow areas would be used. Because the borrow areas have no aquatic resources, no short-term or long-term impacts would occur. No long-term impacts to aquatic or terrestrial resources would occur following reclamation of the borrow areas.

4.6 No Action Alternative

Under the No Action alternative, no contaminated materials would be remediated or removed from the Moab site or vicinity properties. There would be no ground water remediation, and no site controls or activities to protect human health or the environment would be undertaken. All site activities, including operations and maintenance activities, would cease, and public access to the site would be unrestricted.

4.6.1 Geology and Soils

Impacts to geological resources underlying the tailings pile would be the same as those under the on-site disposal alternative, as stated in Section 4.1.1.1. Contaminated on-site soils would not be disturbed. In addition, without the mitigating effect of dike construction, the effects of floods of the Colorado River may progressively erode and remove the east side of the tailings over the next 1,000 years. Soil erosion would not be controlled, and contaminated materials, including soils, could discharge to Moab Wash and the Colorado River during storms.

4.6.2 Air Quality

Without continuing dust control, air quality standards relating to particulate emissions would be violated under the No Action alternative.

4.6.3 Ground Water

Existing conditions at the Moab site would persist under the No Action alternative. Because a ground water compliance strategy would not be developed, no remedial action would be taken. The three mechanisms for contaminant transport described in Section 4.1.3 (downward seepage

of contaminated fluids, upward flux of contaminants, and lateral movement of the legacy plume) would probably produce the following impacts under the No Action alternative, assuming the pile remained in the same location and was not capped.

Seepage of tailings fluids from the tailings pile would be expected to contribute a continuous source of 1,100 mg/L ammonia to the alluvial ground water. The seepage rate of pore fluids from the tailings pile would decline from the current rate of 20 gpm until most pore fluids in the tailings were drained (i.e., tailings were consolidated). Once the transient drainage was complete (in approximately 20 years), a steady-state rate of 8 gpm would be reached. The assumptions for ammonia concentrations and seepage rate as a function of time are summarized in Table 4–53.

Table 4–53. Assumptions for Liquid Drainage from the Tailings Pile and Ammonia Concentrations for the No Action Alternative

Parameter	Value
Infiltration rate	1×10^{-7} cm/s
Gravity drainage	Constant rate: 8 gpm
Transient drainage	Rate would decay from 12 gpm at present to 0 gpm at 20 years
Initial ammonia concentration seepage from base of tailings pile	1,100 mg/L
Breakthrough ammonia concentration from upper salt layer	18,000 mg/L
Arrival time	168 years
Final concentration	1,100 mg/L
Exit time	217 years

Ground water flow and transport modeling (DOE 2003a) was performed to evaluate the impact of the No Action alternative to the ground water system near the Colorado River from the three contaminant transport mechanisms. Results of the modeling are presented in Figure 4–21. Predicted concentrations plotted in Figure 4–21 represent the maximum ammonia-N concentration from a series of observations, located along a transect parallel to the Colorado River downgradient from the toe of the tailings pile near the center of the plume. The modeling results indicate that most of the ammonia flux from the brine layer and the legacy plume in the alluvial aquifer would flush naturally to the river in approximately 75 years. At that time, it is anticipated that the maximum ground water concentrations near the river will have declined to approximately 6 mg/L.

Modeling results indicate that ammonia concentrations in ground water near the bank of the Colorado River would decline from the current 500 to 1,000 mg/L ammonia to a maximum of approximately 6 mg/L in 75 years. The predicted concentration in ground water at 75 years is illustrated in Figure 4–22. As shown in Figure 4–21, the No Action alternative would not meet the 3-mg/L target goal, and ammonia concentrations would remain above background.

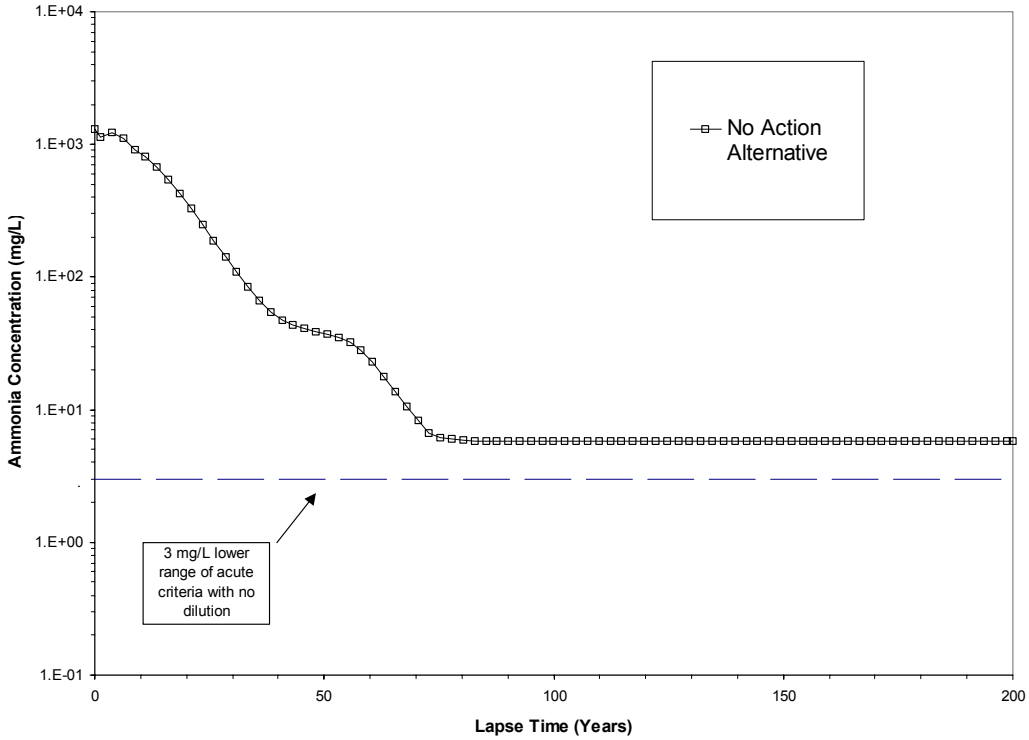

Figure 4–21. Predicted Maximum Ammonia Concentrations in Ground Water Adjacent to the Colorado River Under the No Action Alternative

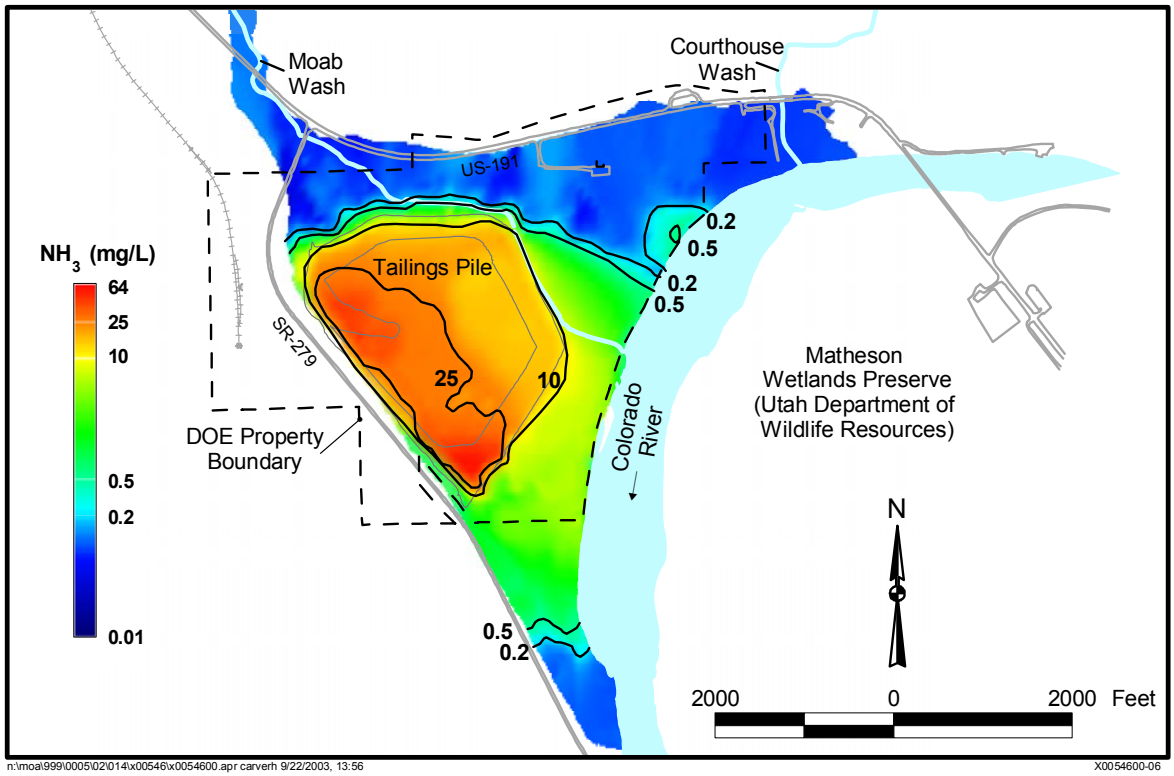

Figure 4–22. Predicted Ammonia Concentrations in the Ground Water After 75 Years Under the No Action Alternative

Discharge of contaminants to the ground water system could be affected by infiltration of precipitation and by rewetting of the base of the tailings pile during flooding, as described in Section 4.1.3. Infiltration of precipitation as a result of not capping the pile would result in seepage of 1,100 mg/L ammonia from the base of the tailings pile at a steady rate of 8 gpm. Infiltration of precipitation could also dissolve salts in the tailings, as described in Section 4.1.3. As a result, there is the potential for ammonia pore fluid concentrations, estimated to be as high as 18,000 mg/L, to influence the ground water system in approximately 168 years. The chemistry of the pore fluid would likely change as it percolated down through the tailings; thus, the ammonia concentration estimated at 18,000 mg/L could be significantly lower.

4.6.4 Surface Water

Contaminated soil and sediment runoff would not be contained and would result in contamination load to the Colorado River over several storm events. Although some soil contamination would be contained by leaving the tamarisk in place, eventually most would reach the Colorado River.

Contaminated ground water would continue to discharge to surface water, and the potential would continue to exist for contaminant concentrations in surface water to exceed federal and state aquatic water quality criteria along the bank of the Colorado River. As with the other alternatives, ground water contaminant concentrations would continue to decrease through time and would result in a corresponding decrease in surface water concentrations as well. However, this decrease would only rely on natural processes and is projected to result in a decrease of ammonia concentrations to approximately 6 mg/L. During the period of time that ground water contaminant concentrations were declining, no active remediation would be conducted, and elevated levels of contaminants, including ammonia, could be expected. Once steady-state concentrations were reached in ground water, ammonia could still be present in surface water, and concentrations would be higher than background levels.

4.6.5 Floodplain/Wetlands

Contaminated soils and the tailings pile would remain in the floodplain of Moab Wash and the Colorado River. Although the No Action alternative would result in fewer short-term surface-disturbing impacts because no construction would take place, implementation of this alternative would contaminate wetlands adjacent to the Colorado River in the long term.

4.6.6 Aquatic Ecology

Under the No Action alternative, ground water would continue to enter the Colorado River at its current state of contamination for an indefinite period of time. As discussed in Appendix A2, contaminants of concern are entering the surface water environment at concentrations that exceed acute and chronic benchmarks for aquatic biota. No ground water remediation to prevent infiltration of contamination in the tailings pile or associated buried mill wastes from reaching the ground water and subsequently entering the aquatic environment would occur under the No Action alternative.

Concentrations of the contaminants of concern are likely affecting the aquatic biota in the nearshore environment of the Colorado River. The concentrations exceed acute and chronic benchmarks (Appendix A2). The Colorado pikeminnow is likely affected by the presence of

these contaminants. The bonytail and humpback chub do not inhabit the river near the site and would not likely be adversely affected. The razorback sucker, although not currently found near the site, does use habitat like that near the Moab site and would thus likely be affected. Appendix A1, "Biological Assessment," discusses potential impacts of this alternative in more detail.

4.6.7 Terrestrial Ecology

Under the No Action alternative, tamarisk at the Moab site would continue to dominate the Colorado River shoreline, and there would be no habitat impacts at the Moab site or at vicinity properties. Consequently, there would be no destruction or displacement of federal- or state-listed species, or wildlife in general, due to habitat alteration. There would also be no disturbance of wildlife except that caused by ambient levels of noise, human presence, vehicles, and other sources.

Because there would be no restoration of the tailings pile at the Moab site, animals could burrow into contaminated soils. This could result in acute and chronic toxic effects to wildlife.

Federal- or state-listed species, or wildlife in general, could be exposed to contaminants in soils at the Moab site and in adjacent nearshore surface water of the Colorado River. Exposure to contaminants in both media may occur via several pathways, including ingestion of prey and water, incidental soil ingestion, dermal uptake from soil and water, and inhalation of airborne contaminants. The primary pathway for wildlife exposure to contaminants in surface water would likely be through ingestion of prey and water within the surface water near the shoreline. Appendix A1, "Biological Assessment," discusses in detail potential impacts to federally listed species from ingestion of prey and water in the nearshore surface water.

No adverse effects are anticipated for wildlife, including federally listed species, from chemical or radioactive contaminants in surface water. However, terrestrial plants could be affected by some of the metals, but only if the plant roots extend into the freshwater aquifer or associated soil water above it. Because the depth of plant roots is currently unknown, potential impacts to plants from contaminants in soils could not be evaluated.

4.6.8 Land Use

Under the No Action alternative, the 439 acres at the Moab site would be unusable for any purpose and would be incompatible with the Grand County land use goals. The site is currently designated as a Specially Planned Area in accordance with Grand County Ordinance 346 of the Grand County North Gateway Plan. This interim planning is valid while reclamation is in effect. Future zoning allows for low-density residential housing. If no actions were taken, the property land use would have to change, because there would be no opportunity for the property to be used for any purpose, and no portion of the property would be available for future beneficial use. The surrounding property values would likely be diminished as a result of the condition of the property and of the uncertainty about the extent of residual contamination. It is also likely that the current and future land use of surrounding properties would change because of proximity to the site.

There would be no land use impacts to BLM lands. There would be no disturbance to BLM lands to secure borrow materials, and no permits or leases on BLM lands would be interrupted.

4.6.9 Cultural Resources

Cultural resources would not be affected under the No Action alternative.

4.6.10 Noise and Vibration

There would be no change in noise or ground vibration levels under the No Action alternative. Similarly, noise and ground vibration impacts associated with the operation of off-site disposal locations, borrow sites, and transportation of tailings and borrow material would not occur.

4.6.11 Visual Resources

The tailings pile would remain in its present condition under the No Action alternative. From the key observation points established for the site (see Section 4.1.11.1), the predominantly smooth, horizontal lines created by the pile would continue to create a moderate contrast with the adjacent vertical sandstone cliffs. Due to its relatively large size, the pile would dominate the view of the casual observer from the southbound US-191 and SR-279 key observation points; however, it would not necessarily be recognized as an anomalous feature, as its red color blends with the reds of the surrounding cliffs. It would likely continue to go unnoticed by many first-time visitors to the Moab area.

The moderate visual contrasts that would occur under this alternative would not be compatible with the Class II objectives that BLM has assigned to the nearby landscapes. Although DOE is not required to meet the objectives of BLM's visual resource management system on the DOE-owned Moab site, the system provides a useful way to measure the effects of the No Action alternative on visual resources.

4.6.12 Infrastructure

Implementation of the No Action alternative would not require the consumption of any additional electric power or water. No additional sanitary waste would be generated.

4.6.13 Solid Waste Management

Under the No Action alternative, DOE would not generate the previously described volumes of solid waste and RRM associated with surface and ground water remediation.

4.6.14 Socioeconomics

Under the No Action alternative, there would be no remediation of ground water or contaminated materials at the Moab site or vicinity properties. Also, public access to the site would be unrestricted, without site controls or activities to protect human health or the environment. Consequently, the potential socioeconomic impacts from the No Action alternative would relate to potential longer-term damages that would result from leaving the pile in its present form. These damages would include potential adverse effects to human health, diminished quality of land and water resources, and potential losses in future economic development opportunities.

As discussed in Section 3.1.19.2, the current risk from exposure to contaminants at the Moab site involves individuals living adjacent to the site (approximately 2,200 ft from the tailings pile) and recreational users of land adjacent to the site (e.g., Moab residents, outdoor recreation visitors). Currently, no members of this public are receiving prolonged exposure to on-site contaminants, which consist of both radioactive and nonradioactive components (e.g., heavy metals). However, in the absence of continued maintenance and monitoring activities at the site, the potential exists for longer-term adverse impacts from exposure to these contaminants.

The No Action alternative also poses greater risks of contamination of the Colorado River due to continued leaching of contaminated materials from the pile and other on-site contamination. The monetary value of these potential environmental damages is difficult to quantify. Nonetheless, the qualitative implications could involve fewer recreational uses of land in the vicinity of the Moab site. Such negative effects could diminish interest in tourism-recreational activities in the two-county socioeconomic region of influence.

As discussed in Section 3.1.18, the regional economy and its tax base are heavily dependent on the seasonally driven tourist-recreation sector. By not undertaking remedial actions at the Moab site, the potential exists for environmental damages, resulting in fewer visitors to the area and thus economic losses to the tourist-based economy in the long term.

4.6.15 Human Health

Under the No Action alternative, people who live in the vicinity properties would continue to be exposed to radon gas and external radiation. In addition, people who live near the Moab site would be exposed to radon gas and radioactive particulates released from the tailings pile.

The vicinity properties near the Moab site have not been extensively characterized. However, on the basis of data from other vicinity properties (DOE 1985), the indoor radon level at vicinity properties was estimated to be about 0.046 working levels (7 pCi/L), and the external gamma exposure rate at vicinity properties was estimated to be 120 µR/h. A person exposed for 8,760 hours per year would have a latent cancer fatality risk of 1.3×10^{-3} for radon and 6.5×10^{-4} for external gamma radiation. The total latent cancer fatality risk for a person at vicinity properties would be 1.9×10^{-3} per year of exposure, or 0.067 if this individual lived at a vicinity property for 35 years, which corresponds to the 5-year operational period plus the 30-year post-operational period evaluated for the on-site and off-site disposal alternatives. If four people lived at each of the estimated 98 vicinity properties, the latent cancer fatality risk for these 392 people would be 0.76 per year of exposure. If these people lived in the vicinity properties for 35 years, about 26 of them would die from cancer caused by the mill tailings contamination.

Monitoring data collected during 2002 and 2003 around the Moab site indicate that the radon concentration at the location of the maximally exposed individual is about 1.9 pCi/L in air. A person exposed for 8,760 hours per year would have a latent cancer fatality risk of 2.4×10^{-4} per year of exposure, or 8.3×10^{-3} for 35 years of exposure. For the population around the Moab site, the latent cancer fatality risk from radon releases would be 0.016 per year of exposure, or 0.56 for 35 years of exposure. On the basis of monitoring data collected during 2002 and 2003, the latent cancer fatality risk from radioactive particulates would be about 7×10^{-7} per year of exposure.

Because there would be no maintenance activities under the No Action alternative, the cover of the mill tailings pile would erode over time and radon releases would increase. For the maximally exposed individual, the latent cancer fatality risk from radon after the cover had been eroded would be about 1.4×10^{-3} per year of exposure, or 0.048 for 35 years of exposure. For the population around the Moab site, the latent cancer fatality risk from radon releases would be 0.15 per year of exposure, or about 5.2 fatalities for 35 years of exposure. Releases of radioactive particulates would also increase and could slightly increase these latent cancer fatality risks.

Under the No Action alternative, no future site-related activities would occur. Therefore, there would be no risks associated with monitoring and maintenance. The only potential future risks would be associated with other uses of the site by recreational users or local residents. Under this alternative, the potential future uses were assumed to be residential (on land northeast of the current tailings pile), rafting (stopping on the site to rest or eat), and camping (overnight stay in areas near the river).

Table 4–54 presents the risks that would occur from on-site contamination to a future resident, rafter, and camper on the Moab site. Using benchmarks of less than a one-in-one-million (1×10^{-6}) probability of developing cancer for the added cancer risks, a hazard index of greater than 1.0 for noncarcinogens, and a dose rate of greater than 100 mrem/yr, indicate that future risks under this alternative would likely exceed this benchmark for the residential scenario but not for the other future land uses. The detailed assumptions and calculation methods used to estimate these risk are presented in Appendix D.

Under the No Action alternative, no maintenance activities would be conducted. Over the 1,000-year time frame, the cover of the mill tailings pile would erode, and radon releases would increase. Over this period of time, the amount of radioactivity in the uranium mill tailings pile will decrease slightly, less than 1 percent, due to the half lives of the radionuclides contained in the uranium mill tailings. The ground water at the Moab site is naturally high in salts and would not be used for human consumption. Releases of radionuclides to surface water would be diluted by the flow of the Colorado River. Consequently, it is unlikely that ground water and surface water would contribute large latent cancer fatality risks relative to inhalation of radon progeny.

For a nearby Moab resident, the annual latent cancer fatality risk from radon after the cover had been eroded would be about 1.4×10^{-3}. As with the radioactivity in the disposal cell, the annual risk will also not decrease appreciably over the 200- to 1,000-year time frame. Therefore, the annual latent cancer fatality risk for a nearby Moab resident would be about the same immediately after the cover had eroded as it would be 1,000 years after the cover had eroded.

For the population around the Moab site, the annual latent cancer fatality risk from radon releases would be 0.15 after the cover had eroded. As with the radioactivity in the disposal cell, the annual risk will also not decrease appreciably over the 200- to 1,000-year time frame. If it is assumed that the population around the Moab site remains constant over 1,000 years, then an estimated 150 latent cancer fatalities over the 1,000-year time period would occur.

It is possible that an inadvertent intruder could occupy the Moab site after the cover eroded. In the short term, the external gamma exposure rates and radon concentrations would be similar to those for workers during remediation of the pile. In the long term, the risks for the inadvertent intruder would be similar to the risks shown in Table 4–54 for the residential scenario.

Table 4–54. Future Potential Risks Under the No Action Alternative

Overall Summary for All Receptors and Pathways (No Action)[a]							
	Added Cancer (Unitless Probability)				Noncarcinogenic Risks (HI)		Notes
	Chemical		Radionuclides				
Receptor	**CT**	**RME**	**CT**	**RME**	**CT**	**RME**	
Resident							Assumes clean, municipal source of domestic water
Adult	9.50×10^{-4}	2.45×10^{-3}	NA	NA	2.91	16.91	
Child	3.02×10^{-4}	7.70×10^{-4}			3.51	19.91	
Rafter							Assumes 1 day of exposure per year
Child	7.51×10^{-9}	9.38×10^{-9}	1.19×10^{-8}	1.48×10^{-8}	0.01	0.02	Exposure would be from child play in contaminated soil and water
Camper							Assumes 1 day of exposure per year
Adult	6.53×10^{-8}	8.16×10^{-6}	3.33×10^{-7}	5.94×10^{-7}	0.16	0.28	Exposure would be from child play in contaminated soil and water
Child	1.12×10^{-7}	2.55×10^{-7}	1.82×10^{-7}	4.09×10^{-7}	0.19	0.43	
Outside Worker							Assumes clean, municipal source of domestic water
Adult	1.36×10^{-7}	1.01×10^{-6}	NA	NA	0.03	0.09	
Dose Assessment							
Resident					**CT**	**RME**	
Deterministic dose (with radon) (mrem/yr)					335	434	House built over contaminated soils northeast of the tailings pile
Risk at year 0 (with radon) (unitless probability)					7.0×10^{-4}	1.4×10^{-3}	
Deterministic dose (without radon) (mrem/yr)					57	88	
Risk at year 0 (without radon) (unitless probability)					2.1×10^{-4}	3.4×10^{-4}	
Rafter							
Deterministic dose (with radon) (mrem/yr)					1.8×10^{-3}	4.7×10^{-3}	
Risk at year 0 (with radon) (unitless probability)					1.2×10^{-9}	2.5×10^{-9}	
Deterministic dose (without radon) (mrem/yr)					1.7×10^{-3}	4.6×10^{-3}	
Risk at year 0 (without radon) (unitless probability)					9.8×10^{-10}	2.3×10^{-9}	
Total risks from radionuclides (includes surface water and radon)					1.2×10^{-9}	2.5×10^{-9}	
Total risks from radionuclides (no radon but includes surface water)					9.8×10^{-10}	2.3×10^{-9}	
Camper							
Deterministic dose (with radon) (mrem/yr)					0.035	0.081	
Risk at year 0 (with radon) (unitless probability)					2.6×10^{-8}	5.7×10^{-8}	
Deterministic dose (without radon) (mrem/yr)					0.035	0.081	
Risk at year 0 (without radon) (unitless probability)					2.6×10^{-8}	5.6×10^{-8}	
Total risks from radionuclides (includes surface water and radon)					2.6×10^{-8}	5.7×10^{-8}	
Total risks from radionuclides (no radon but includes surface water)					2.6×10^{-8}	5.6×10^{-8}	
Outside Worker							
Deterministic dose (with radon) (mrem/yr)					67	105.4	
Risk at year 0 (with radon) (unitless probability)					2.7×10^{-4}	1.1×10^{-3}	
Deterministic dose (without radon) (mrem/yr)					37	28	
Risk at year 0 (without radon) (unitless probability)					1.9×10^{-4}	3.7×10^{-4}	

[a]See Appendix D for additional details on the assumptions and calculation methods used to estimate the risks.
Note: HI = Hazard Index, CT = central tendency, RME = reasonable maximum exposure.

4.6.16 Traffic

With no work activities at the Moab site, there would be no traffic associated with accessing the site. The minor amount of traffic associated with current site activities would no longer occur.

4.6.17 Tailings Pile Failure from Natural Phenomena

Overall, the possibility of failure and the consequences would be the greatest under the No Action alternative because it would not include the use of engineering controls to mitigate impacts from floods and other natural events, as would occur under the on-site disposal alternative. Because no additional engineered enhancements (e.g., riprap) would be added under the No Action alternative, this alternative would be expected to have consequences closer to the high end of the tailings release assumptions (80 percent tailings release) and risk ranges listed for the on-site disposal alternative assuming a hypothetical failure event.

4.6.18 Environmental Justice

The basis for DOE's analysis of environmental justice impacts is described in Section 4.1.18. An assessment of the census data found that, within the 50-mile radius of the Moab site, less than 1 percent of the population had a household income below $18,244 (the poverty level for a family of four). There is no evidence that a minority population would be exposed to risk at a level higher than the general population.

Although the impacts of the No Action alternative could be high and adverse, DOE has identified no minority or low-income populations that would be disproportionately affected under this alternative.

4.7 Mitigation Measures

The regulations promulgated by the Council on Environmental Quality to implement the procedural provisions of NEPA (40 CFR 1500–1508) require that an EIS include a discussion of appropriate mitigation measures (40 CFR 1502.14[f], 40 CFR 1502.16[h])**.** The term "mitigation measures" includes measures taken to

- Avoid impacts by not taking all or part of an action.
- Minimize impacts by limiting the degree or magnitude of the action and its implementation.
- Rectify impacts by repairing, rehabilitating, or restoring the affected environment.
- Reduce or eliminate impacts by preservation and maintenance operations during the action.
- Compensate for an impact by replacing or substituting resources or environments.

This section specifies measures that could be taken to mitigate adverse impacts associated with DOE's proposed remediation of the Moab site. Most of the mitigation measures discussed would be applicable in some degree to all of the alternative actions and transportation modes described in this EIS. Therefore, mitigation measures are not discussed for each action alternative. Those measures that would be uniquely associated with a specific alternative action or transportation mode (e.g., railroad crossing gates) are identified.