Current Status and Potential Impacts Regarding the Proposed Development of a Rail Line to the Yucca Mountain Nuclear Waste Repository

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ABSTRACT

This paper provides a description of the current status regarding the proposed development of a rail line to the Yucca Mountain Nuclear Waste Repository in Nye County, Southern Nevada, which includes potential impacts analyzed during the National Environmental Policy Act (NEPA) process, and the subsequent creation of an Environmental Impact Statement (EIS) for the rail line. Potential impacts are addressed within the context of impacts to natural and human environmental resources found within the geographic area of the proposed federal project. Potential impacts to these resources have been fully analyzed in the Rail Alignment Draft EIS (DEIS). This paper includes a summary of the potential impacts analyzed in the DEIS. Examples of potential impacts include land use conflicts, air quality, water use, and impacts to biological and cultural resources, among others.

INTRODUCTION

The United States has focused a national effort on siting and developing a geologic repository for disposal of spent nuclear fuel and high-level radioactive waste, and on developing systems in preparation for transporting these materials from their locations throughout the country to a repository. On October 12, 2007, the Notice of Availability for the Draft Rail Alignment EIS (DEIS) was published (Notice of Availability of the Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, NV and Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada—Nevada Rail Transportation Corridor and Draft Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, NV; 72 FR 58071). The DEIS has been circulated for review and comment to government agencies, interested private citizens, and local organizations, and was available for general review in publicly accessible locations. The 90-day public comment period ended on January 10, 2008. During the public comment period, DOE held eight public hearings at six locations in Nevada, one location in California, and one location in Washington, DC.
On April 8, 2004, the Department of Energy issued a Record of Decision announcing its selection, both nationally and in the State of Nevada, of the mostly rail scenario analyzed in the Yucca Mountain Final Environmental Impact Statement (FEIS) as the primary means of transporting spent nuclear fuel and high-level radioactive waste to the repository (Record of Decision on Mode of Transportation and Nevada Rail Corridor for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, NV; 69 FR 18557, April 8, 2004). Implementation of the mostly rail scenario ultimately would require the construction of a rail line to connect the repository site at Yucca Mountain to an existing rail line in the State of Nevada. To that end, in the same Record of Decision, the Department also selected the Caliente rail corridor from several corridors considered in the Yucca Mountain FEIS as the corridor in which to study possible alignments for a rail line. On the same day DOE selected the Caliente corridor, it issued a Notice of Intent to prepare an EIS under NEPA to study alternative alignments within the Caliente corridor (the Rail Alignment EIS; DOE/EIS-0369) (Notice of Intent to Prepare an Environmental Impact Statement for the Alignment, Construction, and Operation of a Rail Line to a Geologic Repository at Yucca Mountain, Nye County, NV; 69 FR 18565, April 8, 2004).

DOE provided two public scoping periods for the Rail Alignment EIS (the first between April 8 and June 1, 2004; the second between October 13 and December 12, 2006). In addition to publications in the Federal Register, DOE extensively advertised all meetings in a broad range of other media such as newspapers, letters, and press releases. For the first scoping period, DOE solicited written comments and held five public scoping meetings in Nevada in May 2004 (69 FR 18565). DOE received more than 4,100 comments from the first scoping period. Some comments suggested that other rail corridors be considered, in particular, the Mina route. In the Yucca Mountain FEIS, DOE had considered but eliminated the Mina route from detailed study because a rail line within the Mina route could only connect to an existing rail line in Nevada by crossing the Walker River Paiute Reservation, and the Tribe had informed DOE that it would not allow nuclear waste to be transported across the Reservation. However, DOE held subsequent discussions with the Walker River Paiute Tribe and, in May 2006, the Tribal Council informed DOE that it would allow the Department to evaluate the potential impacts of constructing and operating a railroad to transport spent nuclear fuel and high-level radioactive waste across its reservation.

On October 13, 2006, after a preliminary evaluation of the feasibility of the Mina rail corridor, DOE announced its intent to expand the scope of the Rail Alignment EIS to include the Mina corridor (Amended Notice of Intent to Expand the Scope of the Environmental Impact Statement for the Alignment, Construction, and Operation of a Rail Line to a Geologic Repository at Yucca Mountain, Nye County, NV; 71 FR 60484). Although the expanded NEPA analysis, referred to as the Nevada Rail Corridor Supplemental EIS (SEIS) and the Rail Alignment EIS, evaluates the potential environmental impacts associated with the Mina rail corridor, DOE has identified the Mina alternative as nonpreferred because the Tribe has since withdrawn its participation in the EIS process. During the second comment period, DOE held one public scoping meeting in Washington, D.C., in October 2006, and eight in Nevada during November 2006 (71 FR 65785). During this second period, DOE received nearly 800 comments, most of which were similar to those from the first comment period.

The Rail Alignment EIS process and schedule contain many steps to encourage input from the public. Citizens, elected officials, special interest groups, and local, state, and federal agencies have provided comments regarding the proposed development of the rail line. The public involvement process has promoted public understanding about the way environmental problems
are being studied and solved. It has also kept the public informed about the project and the EIS. Perhaps, most importantly, it has actively sought opinions and perceptions from concerned citizens. Scoping has provided an early and open opportunity for public review of the project. During the scoping period, public input, both written and oral, has been sought on issues that the Rail Alignment DEIS addresses.

**POTENTIAL IMPACTS**

A critical component of any EIS is identifying potential environmental impacts due to a proposed action. A variety of factors related to the public health and environment are analyzed to determine potential environmental impacts, and possible mitigation measures. This section of the paper describes areas of concern for the proposed development of a rail line, providing information on the resources potentially impacted, and details of specific issues and potential impacts.

**Land Use and Ownership**

**Private Land**

DOE would need to gain access to private land—up to 0.72 square kilometer (178 acres) for the Caliente rail alignment and up to 0.59 square kilometer (146 acres) for the Mina rail alignment. For the Caliente rail alignment, another possible 1.15 square kilometers (284 acres) of private land would be required to accommodate support facilities. Neither rail alignment would displace existing or planned land uses over a substantial area, nor would they substantially conflict with applicable land-use plans or goals. The areas with the highest density of private land that either rail alignment would cross are the towns of Caliente (Caliente rail alignment) and Goldfield (both rail alignments). For the Caliente alternative segment, some structures at the existing Union Pacific train yard and three structures along the former Pioche and Prince Branchline would need to be demolished or relocated. The Caliente alternative segment would also occupy portions of the access road and parking lot of the Caliente Hot Springs Motel. The motel could be adversely affected because of the rail line’s proximity. Alternative segments near Goldfield would cross vacant private land, including patented mining claims.

**Tribal Land**

In response to concerns from the Timbisha Shoshone Tribe, DOE avoided Timbisha Shoshone Trust Lands during the development of the Caliente and Mina rail alignments. The closest rail line segment along either rail alignment would be common segment 5, which would be approximately 3 kilometers (2 miles) east of Timbisha Shoshone Trust Lands near Scottys Junction. DOE initially studied the Mina rail alignment with the participation of the Walker River Paiute Tribe and the Department designed the Schurz alternative segments with the aim of removing the existing Department of Defense branchline through the town of Schurz in accordance with the Tribe’s request. The Schurz alternative segments would utilize up to 0.5 percent of the land area of the Reservation (up to 5.3 square kilometers [1,300 acres]).

**Public Land**

The Caliente rail alignment would utilize up to 162 square kilometers (40,000 acres) of BLM administered land out of a total construction footprint of approximately 170 square kilometers (41,000 acres), and the Mina rail alignment would utilize up to 113 square kilometers (28,000 acres).
acres) of BLM administered land out of a total construction footprint of approximately 125 square kilometers (31,000 acres).

The Mina rail alignment would cross 4.6 square kilometers (1,150 acres) of land within the Hawthorne Army Depot near its northern border, where it would not pose a conflict with the Depot’s mission or land uses.

Railroad construction would result in surface disturbance across a number of grazing allotments on BLM-administered land. However, because the land would be restored after the construction phase and the operations right-of-way would be smaller than the construction right-of-way, long-term impacts would be small. Individual rail line segments would result in less than a 2-percent loss of animal unit months (a measure of the amount of forage needed to sustain one animal for 1 month) across all affected allotments for either rail alignment. The rail line could require livestock on some allotments to adjust to new routes to access water and forage. Generally, livestock could learn new routes and acclimate to and cross the rail line. The rail line could pose additional risk to ranching operations because livestock could be struck by passing trains. DOE or the railroad’s commercial operator would reimburse ranchers for such losses, as appropriate.

The rail alignments would cross a number of utility rights-of-way. DOE would negotiate crossing agreements with right-of-way holders and the BLM. DOE would protect existing utilities from damage so that disruption to utility service or damage to lines would be at most small and temporary. The project would require a BLM right-of-way outside existing BLM planning corridors for utilities. Under the longest potential routes, approximately 25 percent of the Caliente rail alignment and 44 percent of the Mina rail alignment (new construction on BLM-managed land) would fall within existing BLM planning corridors.

Mining
Most of the local mining activity along both the Caliente and Mina rail alignments would be outside the rail line construction right-of-way. DOE would need to negotiate the surface rights to cross the few affected unpatented mining claims the rail line would intersect. Along the Caliente rail alignment, the rail line would intersect unpatented mining claims along South Reveille alternative segments 2 and 3; Caliente common segment 3; Goldfield alternative segments 1, 3, and 4; Oasis Valley alternative segments 1 and 3; and common segment 6. The Mina rail alignment would intersect unpatented mining claims along Montezuma alternative segments 1, 2 and 3; Oasis Valley alternative segments 1 and 3; and common segment 6. The rail line could be affected by or affect underground mining tunnels or shafts. During the final engineering design, DOE would perform a survey to verify the locations of mining tunnels and shafts and implement measures to avoid adverse impacts.

Wilderness Areas
Rail alignments have been developed to avoid Wilderness Areas and scenic and recreational areas. Under either implementing alternative, DOE would construct crossings to prevent the rail line from obstructing access to public land. While there could be temporary road closures or detours during the construction phase, there would be no impact to land access during the operations phase. In addition, organized off-highway vehicle events permitted in the past by the BLM might need to alter their routes to avoid the rail line.

Air Quality
The Caliente and Mina rail alignments would cross desert and semi-desert areas that generally have abundant hours of cloud-free days, low annual precipitation, and large daily ranges in
temperature. All portions of the Caliente and Mina rail alignments would be within areas classified by the U.S. Environmental Protection Agency as in attainment for all National Ambient Air Quality Standards (NAAQS).

DOE examined emissions inventories to determine county-level increases in air pollutant emissions, and performed air quality simulations to determine potential changes in air pollutant concentrations at specific (population-center) receptors. An adverse impact to air quality would occur if it were shown that a proposed action would conflict with or obstruct implementation of a state or regional air quality management plan, or would exceed an NAAQS primary standard or contribute to existing or projected exceedances. DOE determined air pollutant concentrations that could result from railroad construction and operation along the Caliente and Mina rail alignments using the Environmental Protection Agency recommended model for regulatory applications (AERMOD dispersion modeling system version 07026). To assess potential air quality impacts from railroad construction and operations along the Caliente rail alignment, DOE modeled emissions and resultant concentrations of criteria air pollutants at two population centers near the rail line: Caliente in Lincoln County and Goldfield in Esmeralda County, and then compared the modeling results to the National Ambient Air Quality Standards. DOE likewise modeled air quality for the Mina rail alignment near the population centers that would be relatively close to the rail line: Schurz, Hawthorne, and Mina in Mineral County; and Silver Peak and Goldfield in Esmeralda County. DOE also performed modeling for the Caliente rail alignment for construction-related activities at a potential quarry site northwest of Caliente and a potential quarry site in South Reveille Valley, and for the Mina rail alignment at the potential Garfield Hills and Malpais Mesa quarry sites.

The analysis showed that criteria air pollutant concentrations along the Caliente or Mina rail alignments would not exceed the NAAQS during the construction or operation phases, with the following possible exceptions. During the construction phase for the Caliente rail alignment, the 24-hour NAAQS for PM10 (particulate matter with an aerodynamic diameter equal to or less than 10 micrometers) could be exceeded during quarry operations in South Reveille Valley. During the construction phase for the Mina rail alignment, the 24-hour NAAQS for both PM10 and PM2.5 (particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers) could be exceeded near the construction right-of-way at Mina and Schurz during the relatively short (less than 6 months) construction period, at the Staging Yard at Hawthorne, and at the potential Garfield Hills quarry. However, DOE would be required to prepare a Surface Area Disturbance Permit Dust Control Plan issued by the State of Nevada Department of Environmental Protection prior to quarry and Staging Yard development. It is likely that requirements in the plan would reduce fugitive dust emissions, thus reducing the possibility of an NAAQS exceedance.

For the Caliente rail alignment, DOE determined that the highest increase in air pollutant emissions would occur during the construction phase. During the operations phase for the Caliente rail alignment, the highest increase would occur in the vicinity of the railroad operations support facilities. The highest increase in criteria air pollutant emissions would be for nitrogen oxides in Nye County, where construction emissions could be as much as 8,100 metric tons (8,900 tons) per year over the county’s 2002 annual nitrogen oxides emissions. However, these emissions would be distributed over the entire length of the rail alignment in the county and no air quality standard would be exceeded.

For the Mina rail alignment, DOE determined that the highest increase in air pollutant emissions would occur during the construction phase. During the operations phase for the Mina rail alignment, the highest increase in air emissions from railroad operations would occur in the
vicinity of the operations support facilities. The highest increase in criteria air pollutant emissions would be for nitrogen oxides in Esmeralda County, where construction emissions could be 3,570 metric tons (3,940 tons) per year higher than the 2002 county-wide nitrogen oxides emissions. However, these emissions would be distributed over the entire length of the rail alignment in the county and no air quality standard would be exceeded.

Hydrology

Surface Water
DOE anticipates that during the construction phase along the Caliente rail alignment, the Staging Yard and the Interchange Yard along either the Caliente or the Eccles alternative segment would require channelization of natural drainage surface waters to keep water out of railroad operations support facility sites. Changes in drainage patterns could result in changes in erosion and sedimentation rates or locations. However, in all instances where the rail alignment would come close to or cross a surfacewater feature, impacts would be substantially minimized by the implementation of engineering design standards and best management practices.

The Caliente alternative segment is adjacent to wetlands and some wetland fill would be unavoidable. DOE proposes to construct the Caliente alternative segment over the abandoned Union Pacific Railroad roadbed, in part to minimize filling wetlands. Of the 0.28 square kilometer (68 acres) of wetlands delineated along the rail alignment, 0.05 square kilometer (12 acres) would be filled to construct the rail line. DOE could modify the final design of the rail line to avoid additional wetlands, such as those adjacent to the old rail roadbed along Meadow Valley Wash, by using a slightly narrower construction footprint; however, this would only slightly reduce the area of wetlands that would be filled.

Approximately 0.09 square kilometer (22 acres) of wetlands could be filled to construct a quarry siding at a potential quarry along the Caliente alternative segment. Approximately 0.19 square kilometer (47 acres) of wetlands would be filled for construction of the Staging Yard at Indian Cove near Caliente. The original wetland meadow area would be drained and built up above the level of the floodplain. Constructing an active drainage system and a channel around the site to keep the area dry and in a stable condition might be necessary. The proposed channel around the site would be approximately 1,680 meters (5,500 feet) long. These actions would require permits from the U.S. Army Corps of Engineers, and compliance with Section 404 of the Clean Water Act.

The Eccles alternative segment Interchange Yard would require portions of Clover Creek to be filled to elevate the site out of the floodplain. For a length of approximately 1,400 meters (4,600 feet) along the bed of this ephemeral creek (for construction of the interchange tracks) the fill would extend approximately 7.6 to 15 meters (25 to 50 feet) into the creek bed. For a length of approximately 900 meters (2,900 feet) on the east end and 600 meters (2,000 feet) on the west end of the interchange tracks, (for construction of the interchange siding), the fill would extend approximately 8 meters (25 feet) into the creek. The total area that would be filled within the confines of Clover Creek would be approximately 0.033 square kilometer (8.2 acres).

Along the Mina rail alignment, there could be temporary impacts from disturbance of about 2,000 square meters (0.55 acre) of wetlands along Schurz alternative segments 1 and 4, and 3,000 square meters (0.73 acre) of wetlands along Schurz alternative segments 5 and 6 during construction of a bridge at the rail line crossing of the Walker River. Permanent fill or loss of wetlands would total about 20 square meters (0.005 acre) for Schurz alternative segments 1 and 4,
or 28 square meters (0.007 acre) for emplacement of about 14 piers for Schurz alternative segments 5 and 6.

While some changes would be unavoidable, DOE would take steps to ensure that the alterations to natural drainage, sedimentation, and erosion processes would not increase future flood damage, increase the impact of floods on human health and safety, or cause identifiable harm to the function and values of floodplains. The Department would implement best management practices, including erosion control measures such as the use of silt fences and flow-control devices to reduce flow velocities and minimize erosion.

**Groundwater**

The lack of shallow groundwater is consistent with the semi-arid climate characterizing the southern Nevada region. To supply the approximately 7.5 million cubic meters (6,100 acre feet) of water needed during the construction phase along the Caliente rail alignment, DOE estimates that it would need to install approximately 150 to 176 new wells. To supply the approximately 7.4 million cubic meters (5,950 acre feet) of water needed during the construction phase along the Mina rail alignment, DOE estimates that it would need to install between approximately 77 and 110 new wells.

DOE analyses indicated that the effects of groundwater withdrawals from the proposed water-supply wells at the range of production rates that could be required to support a 4-year construction phase along either rail alignment would be localized in nature and extent, and hydrogeologic effects would be temporary. DOE determined that the short-term impacts caused by water withdrawals would be a series of localized drawdown cones of depression within the host aquifer surrounding each pumped well. DOE does not anticipate that proposed groundwater withdrawals would conflict with known regional or local aquifer management plans or the goals of governmental water authorities, and impacts from groundwater withdrawals on downgradient groundwater basins (or hydrographic areas) would tend to be very small.

DOE anticipates that the impact to groundwater resources from contaminants that might be released by construction equipment during the construction phase or during railroad operations would be small because of generally deep groundwater beneath most of the Caliente and Mina rail alignments. Railroad operations along the Mina and Caliente rail alignments would result in small potential impacts to groundwater resources. The Department would discontinue operating most of the wells needed during the construction phase because there would not be a continued need for large-scale water production to support railroad operations. Additionally, groundwater withdrawal rates for those wells left in place to support operations would be expected to be very low.

Overall, water demands for railroad construction and operations along the Caliente or the Mina rail alignment would represent a small portion of current water-use amounts in their respective regions of influence, which would likely continue to be dominated by irrigation and agricultural withdrawals, with possibly increasing urban use from water transfers to the Las Vegas area. DOE determined that impacts to ground subsidence or groundwater quality that could result from railroad construction and operations along either rail alignment would be small.

**Biological Resources**

The Caliente and Mina rail alignments are situated within the “cold” Great Basin Desert, covering most of central and northern Nevada, and the “hot” Mojave Desert covering much of southern
Nevada and southeastern California. Although the two deserts are distinguished climatically, they are also distinguished by their predominant vegetation and vegetation communities. For both the Caliente rail alignment and the Mina rail alignment, DOE determined that there would be some indirect adverse impacts due to the potential for the introduction and spread of noxious and invasive weed species during construction activities; however, the Department would minimize or avoid impacts through implementation of best management practices and BLM-prescribed methods. DOE concluded there would be a small mostly short-term indirect impact to game species during railroad construction and operations along either rail alignment, due to temporary displacement causing pressure on other areas for habitat and forage. There could be small direct impacts due to a small loss of forage from the removal of vegetation to construct the proposed railroad. In addition, railroad operations could result in possible wildlife collisions with trains and disturbance from noise caused by passing trains. However, these impacts would not impact the viability of any game species’ population.

DOE determined that federally listed species potentially present along the Caliente and Mina rail alignments could include the Mojave Desert tortoise, southwestern willow flycatcher, yellow-billed cuckoo, Lahontan cutthroat trout, and Ute ladies'-tresses orchid. There would likely be small short-term indirect impacts to some BLM and State of Nevada special status animal species because they might avoid the area of the rail alignment or be displaced during construction activities. Any potential direct impact would be due to habitat fragmentation and disturbance and possible injury or loss of individuals of a species from collision with trains. There could be indirect impacts on small mammals as a result of possible changes to predator/prey interactions due to the construction of towers and other structures that would provide new perch habitat for raptors and other predatory birds. DOE determined that potential impacts from noise disturbance to migratory birds would be small and short term during construction and small from permanent habitat loss during the operations phase. Potential direct impacts to desert tortoise would be due to fragmentation of habitat and the possible crushing of occupied burrows during construction of common segment 6 and the Rail Equipment Maintenance Yard. Although these losses would be a minor decrease in the number of individual tortoises in the vicinity of the railroad, long-term survival of this species would not be affected. For both the Caliente rail alignment and Mina rail alignment, DOE determined that impacts to herd management areas and potential impacts to individual wild horses or burros would be small and would not significantly affect the management strategies utilized within the herd management areas.

DOE determined there would be a moderate impact to wildlife habitat along Garden Valley alternative segments 1 and 3. Localized and minor loss of roosting and foraging habitat for the southwestern willow flycatcher and western yellow-billed cuckoo could occur from construction of the Caliente alternative segment; however, because these species do not nest along the alignment, impacts would be small and limited to transient individuals.

DOE determined that for the Mina rail alignment there would be direct short-term impacts to riparian vegetation from construction of Schurz alternative segment 1, 4, 5, or 6 due to bridge construction over the Walker River. There would be no long-term impacts on riparian vegetation along the Walker River as a result of constructing any of the Schurz alternative segments. There would be short-term moderate impacts to wildlife habitat at the potential Malpais Mesa quarry site. Construction of the Walker River Bridge for Schurz alternative segment 1, 4, 5, or 6 could result in a moderate short-term indirect impact on Lahontan cutthroat trout; however, DOE could mitigate any anticipated impact.

Cultural Resources
Railroad construction and operations could lead to unavoidable changes in cultural landscapes, such as changes to ethnographic, rural historic, and historic viewscapes. Cultural landscapes along the Caliente rail alignment include historic-period Western Shoshone villages and surrounding use areas in the Oasis Valley, the Goldfield area, and Stone Cabin and Reveille Valleys; early ranching operations in the Stone Cabin and Reveille Valleys; the historic Mormon settlement of Meadow Valley Wash, and the Goldfield, Clifford, and Reveille Mining Districts. Cultural landscapes along the Mina rail alignment include historic-period Northern Paiute use of the Walker River and Walker Lake areas, historic-period Western Shoshone villages and surrounding use areas in the Oasis Valley and Goldfield areas, and historic mining in the Luning, Mina, and Goldfield districts.

DOE completed literature reviews and a Class II inventory (sample field surveys within the construction right-of-way) for 20 percent of each alternative segment and common segment along the Caliente and Mina rail alignments, and has thereby identified some potential areas of specific impacts. Additionally, DOE conducted an intensive Class III inventory along a 12-kilometer (7.4-mile) corridor within the Yucca Mountain Site boundary, which resulted in the identification of seven sites and five isolates (isolated artifacts).

Based on preliminary information and the sample surveys conducted to date, the magnitude of impacts along both the Caliente and Mina rail alignments would range from small to moderate due to the extensive effort DOE would undertake to avoid or mitigate impacts to cultural resources in accordance with the regulatory framework and with the terms of the Programmatic Agreement.

Occupational and Public Health and Safety
Accidents
DOE estimated radiological impacts to workers and the public for incident-free transportation, the risk of transportation accidents, and the impacts of severe transportation accidents.

DOE estimated the following:

- For workers, the radiological impacts were estimated to be 0.34 latent cancer fatalities for the Caliente rail alignment and 0.35 latent cancer fatalities for the Mina rail alignment.

- For workers at the Cask Maintenance Facility, the radiological impacts were estimated to be 0.43 latent cancer fatalities. For workers at the Rail Equipment Maintenance Yard, the radiological impacts were estimated to be 0.0096 latent cancer fatalities.

- For members of the public, the radiological impacts were estimated to be $1.4 \times 10^4$ latent cancer fatalities for the Caliente rail corridor and $8.5 \times 10^4$ latent cancer fatalities for the Mina rail alignment.

- For members of the public, the radiological impacts from the Cask Maintenance Facility were estimated to be $7.0 \times 10^4$ latent cancer fatalities.

- The risk from transportation accidents was estimated to be $1.3 \times 10^4$ latent cancer fatalities for the Caliente rail alignment and $7.7 \times 10^4$ latent cancer fatalities for the Mina rail alignment.
The impacts of the maximum reasonably foreseeable accident were estimated to be 0.0012 latent cancer fatalities in rural areas and 0.46 latent cancer fatalities in suburban areas along the Caliente rail alignment, and 0.0089 latent cancer fatalities in rural areas and 1.2 latent cancer fatalities in suburban areas along the Mina rail alignment. The frequency of this severe accident ranged from $6 \times 10^{-7}$ to $7 \times 10^{-7}$ per year.

Sabotage

In response to the terrorist attacks of September 11, 2001, and to intelligence information that has been obtained since then, the United States Government has initiated nationwide measures to reduce the threat of sabotage. These measures include security enhancements intended to prevent terrorists from gaining control of commercial aircraft and additional measures imposed on foreign passenger carriers and domestic and foreign cargo carriers, as well as charter aircraft.

The Federal Government has also greatly improved the sharing of intelligence information and the coordination of response actions among federal, state, and local agencies. DOE has been an active participant in these efforts. In addition to its domestic efforts, DOE is a member of the International Working Group on Sabotage for Transport and Storage Casks, which is investigating the impacts of sabotage events and exploring opportunities to enhance the physical protection of casks.

The Department, as required by the NWPA, would use Nuclear Regulatory Commission-certified shipping casks. Spent nuclear fuel is protected by the robust metal structure of the shipping cask, and by cladding that surrounds the fuel pellets in each fuel rod of an assembly. Further, the fuel is in a solid form, which would tend to reduce dispersion of radioactive particulates beyond the immediate vicinity of the cask, even if a sabotage event were to result in a breach of the multiple layers of protection.

In addition, the Nuclear Regulatory Commission has promulgated rules (10 CFR 73.37) and interim compensatory measures (67 FR 63167, October 10, 2002) specifically to protect the public from harm that could result from sabotage of spent nuclear fuel casks. The Department has committed to following these rules and measures (see 69 FR 18557, April 8, 2004).

For the reasons stated above, DOE believes that under general credible threat conditions the probability of a sabotage event that would result in a major radiological release would be low. Nevertheless, because of the uncertainty inherent in the assessment of the likelihood of a sabotage event, DOE has evaluated events in which a military jet or commercial airliner would crash into a spent nuclear fuel cask or a modern weapon (a high energy density device) would penetrate a spent nuclear fuel cask.

In the Yucca Mountain FEIS (Appendix J, Section J.3.3.1), DOE evaluated the ability of large aircraft parts to penetrate shipping casks and found that neither the engines nor shafts would penetrate a cask and cause a release of radiological materials if an aircraft were to crash into a spent nuclear fuel cask. In the Yucca Mountain FEIS, DOE estimated the potential impacts of a sabotage event in which a high energy density device penetrates a rail cask. For the Rail Alignment EIS, DOE obtained more recent estimates of the fraction of spent nuclear fuel materials that would be released (release fractions) (DIRS 104918-Luna et al. 1999, all). Based on the more recent information DOE estimated that there would be 0.0028 latent cancer fatalities in rural areas and 1.1 latent cancer fatalities in suburban areas along the Caliente rail alignment,
and 0.021 latent cancer fatalities in rural areas and 2.8 latent cancer fatalities in suburban areas along the Mina rail alignment.

In addition to analyzing the impacts of sabotage events, the Department would continue to modify its approach to ensuring safe and secure shipments of spent nuclear fuel and high-level radioactive waste between now and the time of shipments.

**Socioeconomics**

The social and economic activities and changes associated with railroad construction along either rail alignment would include a brief elevation in construction-related employment; increases in real disposable income; increases in state and local spending; increases in gross regional product; population increases; slower rate of growth in the level of employment as railroad project activities moved from construction to operations; and possible small stresses on transportation, including small traffic-delay impacts on road traffic at grade crossings. The percentage values of such changes would be low and DOE has assessed such impacts to be generally small.

Changes associated with railroad operations along either rail alignment would include increases in project-related employment (particularly associated with railroad facilities); slight population increases; possible small stresses on transportation, including small traffic-delay impacts on road traffic at grade crossings; some pressure on housing; and possible strains on public services (schools, health care, fire protection) in southern Nye County where the Cask Maintenance Facility, Rail Equipment Maintenance Yard, and possibly the Nevada Railroad Control Center and the National Transportation Operations Center would be located. The percentage values of such changes would be low and DOE has assessed such impacts to be generally small to moderate.

**Noise and Vibration**

For operation of trains during the construction and operations phases, DOE analyzed noise impacts under established STB impact criteria (a noise level of 65 DNL or greater, with a 3 dBA or greater increase from the baseline). For noise impacts from construction activities, DOE used U.S. Department of Transportation, Federal Transit Administration, methods and construction noise guidelines. To evaluate potential vibration impacts from construction and operation activities, DOE used Federal Transit Administration building vibration damage and human annoyance criteria.

DOE determined that railroad construction and operations along the Caliente rail alignment would lead to an unavoidable increase in ambient noise from construction activities and passing trains. Noise from trains might be noticeable as new noise in residential areas near the rail line in Caliente and Goldfield. Because there is already a substantial amount of train activity in Caliente, additional train noise would be less noticeable than in other areas where there is currently no train activity and no train noise. For construction activities, noise levels in Caliente would be higher than Federal Transit Administration construction noise guidelines and would result in a temporary unavoidable impact. Train noise during the construction and operations phases would not cause adverse noise impacts because noise levels at receptors would be lower than STB adverse impact criteria.

DOE determined that railroad construction and operations along the Mina rail alignment could lead to an unavoidable increase in ambient noise from passing trains in areas of Nevada that are
mostly uninhabited. Noise from trains might be noticeable as new noise in residential areas near the rail line in Silver Springs, Silver Peak, Mina, and Goldfield. Because there is already some train activity in Silver Springs, additional train noise would be less noticeable there than in other areas where there is currently no train activity and no train noise. Construction of any of the Schurz alternative segments would eliminate future noise and vibration associated with operation of the existing Department of Defense Branchline through Schurz. However, there would be construction noise associated with removal of this existing rail line, although this noise would be temporary and no adverse impact would be expected.

For construction activities, noise levels along the Mina rail alignment would be lower than Federal Transit Administration construction noise guidelines. For train noise during the construction phase, there would be temporary adverse impacts at receptors in Silver Springs. For train noise during the operations phase, estimated noise levels at 8 receptors in Silver Springs and 1 in Wabuska would be higher than impact criteria; therefore, there would be adverse impacts from noise associated with railroad operations at those locations. However, DOE would investigate mitigation methods for these nine locations. Mitigation methods, where reasonable and feasible, could include building sound insulation or the development of a Quiet Zone, which would allow the rail operator to reduce horn noise at specific crossings.

During the construction and operations phases along either the Caliente or Mina rail alignment, vibration levels would not exceed the Federal Transit Administration damage criteria for extremely fragile historic buildings. Therefore, DOE would expect no building damage due to vibration. In addition, train-generated vibration levels would be lower than Federal Transit Administration human annoyance criterion.

Aesthetics

Most of the lands that would be affected by the Proposed Action are BLM-administered public lands, including those on which the proposed railroad would be constructed. For this reason, DOE used BLM visual resource management classifications and contrast rating methodologies to evaluate aesthetic impacts to the surrounding viewshed. The BLM assigns visual resource management classes to lands under its jurisdiction, based on scenic quality and other factors, that range from Class I to Class IV, with Class I representing the highest visual values. Each class comes with specific visual resource management objectives that indicate the levels of project-related contrast that are acceptable. In this analysis, the primary basis for identifying potential adverse impacts to aesthetic resources was inconsistency with these BLM visual resource management objectives. The Department assessed the potential visual contrast between existing conditions and conditions expected during the project from key locations and compared these levels of contrast with the visual resource management objectives associated with the BLM classifications of the surrounding viewshed.

Along both the Caliente and the Mina rail alignments, DOE found that the contrast that would be caused by the rail line and support facilities would remain consistent with BLM visual resource management objectives during the operations phase, but could be inconsistent in certain locations during the construction phase. Along the Caliente rail alignment, a conveyor crossing of U.S. Highway 93 near the Caliente-Indian Cove location of the Staging Yard and along some portions of Garden Valley alternative segments 1, 2, 3, and 8, construction would temporarily not meet BLM visual resource management objectives for Class II areas.
Along the Mina rail alignment, DOE determined that construction of Schurz alternative segment 6 crossing of U.S. Highway 95 on the Walker River Paiute Reservation would temporarily not meet BLM objectives for Class III areas. Overall, DOE anticipates that short-term visual impacts during the construction phase would range from small to large, and long-term impacts during the operations phase would range from small to moderate and would be consistent with applicable BLM visual resource management objectives.

Utilities, Energy, and Materials

DOE determined that the demands placed on utilities, energy, and materials from constructing and operating the proposed rail line along either rail alignment would be met by existing supply capacities; therefore, potential impacts would be small. Utility interfaces would have the potential for short-term interruption of service, but would experience no permanent or long-term loss of service or prevention of future service-area expansions. Most water for construction along either rail alignment is planned to be supplied by new wells, although public water systems could be slightly affected by population increases attributable to construction employees. Wastewater treatment systems would not be directly affected by construction activities, because dedicated treatment systems would be provided at construction camps; however, there could be small impacts to wastewater treatment systems due to population increases attributable to construction employees. There would be very small impacts to telecommunications systems because during the construction phase, DOE would utilize a dedicated telecommunications system and rely little on existing telecommunications systems.

Peak electricity demand would be within capacity of regional providers. The demand for fossil fuels during construction would be approximately 6.5 percent and 6 percent of statewide use for the Caliente and Mina rail alignments, respectively, and could be met by existing regional supply systems and suppliers. During the operations phase, the demand for fossil fuels for either rail alignment would be less than 0.25 percent of statewide use. The primary materials that would be consumed during the construction phase would be steel; concrete, principally for rail ties, bridges, and drainage structures; and rock for ballast and subballast. DOE determined that construction material requirements for the Caliente rail alignment and for the Mina rail alignment would be a small fraction of current production rates within the respective regions of influence.

Hazardous Materials, Pollution Prevention, and Solid Waste

During railroad construction and operations, DOE would store and use hazardous materials such as oil, gasoline, diesel fuel, and solvents, primarily for the operation, maintenance, and cleaning of equipment and cleaning of equipment and facilities, which would result in the generation of associated hazardous wastes. During the railroad construction and operations phases, the Department would implement an Environmental Management System and a Pollution Prevention/Waste Minimization Program, which would include an evaluation of methods to eliminate, reduce, or minimize the amounts of hazardous materials used and hazardous wastes generated. Ample disposal capacity is available for the disposal of hazardous waste during the construction and operations phase. DOE would implement appropriate planning measures for the storage and handling of hazardous materials and comply with applicable regulations.

The Department would dispose of nonrecyclable or nonreusable waste in permitted landfills. During construction, it is likely that, if utilized, some of the larger landfills would not see an appreciable change in the amount of waste received if they were utilized; however, some of the
smaller landfills, if utilized, might see a substantial, although manageable, change in daily receipt of solid, and industrial, and special wastes.

DOE estimates that railroad construction along the Caliente rail alignment would increase the overall rate of disposal of solid waste by less than 0.01 percent and industrial and special waste by about 0.261 percent. DOE anticipates that impacts to local landfills from the disposal of solid and industrial and special these wastes would be small (for the relatively large Apex Landfill) to moderate (for the smaller landfills such as Goldfield Class I).

DOE estimates that railroad construction along the Mina rail alignment could generate three times the amount of industrial and special waste as would railroad construction along the Caliente rail alignment. This is because of wastes from dismantling the Department of Defense Branchline through the town of Schurz. However, to the extent practicable, these wastes would be recycled to minimize waste volumes. DOE estimates that railroad construction along the Mina rail alignment would increase the overall rate of disposal of solid waste by 0.077 percent and, industrial and special waste by about 0.41 percent and 9 percent. DOE anticipates that impacts to local landfills from the disposal of these solid, industrial, and special wastes would be small (for the relatively large Apex Landfill) to moderate (for the smaller landfills such as Goldfield Class I).

During railroad operations along either the Caliente or Mina rail alignment, the generation of wastes would be substantially less than during the construction phase. DOE anticipates that railroad operations along either alignment would produce similar amounts of wastes. Therefore, impacts to landfills during operations would be small, because ample disposal capacity would be available for either rail alignment.

Activities at the Cask Maintenance Facility would generate from 3,200 to 7,900 cubic meters (113,000 to 280,000 cubic feet) of Class A low-level radioactive waste throughout the railroad operations phase. DOE would control and dispose of site-generated low-level radioactive waste in a DOE low-level waste disposal site, a site in an Agreement State, or in a U.S. Nuclear Regulatory Commission-licensed site, all of which currently have ample capacity to accept these wastes. Therefore, impacts to low-level radioactive waste disposal facilities would be small. No low-level radioactive waste is anticipated to be generated during construction activities; therefore, no impacts to disposal facilities would occur.

Environmental Justice

DOE determined whether there would be minority or low-income populations in the Caliente or Mina rail alignment regions of influence for environmental justice, and assessed whether any high and adverse impacts could fall disproportionately on minority or low-income populations. DOE also considered whether minority or low-income populations would be affected by an alternative in different ways than the general population, such as through unique exposure pathways or rates of exposure, special sensitivities, or different uses of natural resources.

For the Caliente rail alignment, the Department determined that railroad construction and operations would not result in disproportionately high and adverse impacts to minority or low-income populations. For the Mina rail alignment, DOE determined that the Schurz population center and the Walker River Census County Division are the only locations where the minority populations exceed the threshold of 50 percent, and the Walker River Census County Division to be the only location where the low-income population exceeds the threshold of 20 percent over the state average of 10.5 percent established by the Nuclear Regulatory Commission and the
Council on Environmental Quality. Because there are no large and adverse impacts in these areas, low-income and minority populations in these areas would be disproportionately affected. Constructing and operating the proposed railroad along the Mina rail alignment would not result in high and adverse impacts to minority or low-income populations.

**CONCLUSION**

Based on its obligations under the NWPA and its decision to select the mostly rail scenario for the transportation of spent nuclear fuel and high-level radioactive waste, DOE needs to ship these materials by rail in Nevada to a repository at Yucca Mountain. DOE prepared the Rail Alignment EIS to provide the background, data, information, and analyses to help decision makers and the public understand the potential environmental impacts that could result from constructing and operating a railroad for shipment of spent nuclear fuel, high-level radioactive waste, and other materials from an existing rail line in Nevada to a repository at Yucca Mountain. This railroad would consist of a rail line, railroad operations support facilities, and other related infrastructure. DOE will use the Rail Alignment EIS to decide whether to construct and operate the proposed railroad, and if so, to:

- Select a rail alignment (Caliente rail alignment or Mina rail alignment) in which to construct the railroad;
- Select the common segments and alternative segments within either a Caliente rail alignment or a Mina rail alignment. The Department would use the selected common segments and alternative segments to identify the public lands to be included in right-of-way applications;
- Decide where to construct proposed railroad operations support facilities;
- Decide whether to restrict use of the rail line to DOE trains, or whether to allow commercial shippers to operate over the rail line; and
- Determine what mitigation measures to implement.