NUREG-1714

Draft
Environmental Impact Statement
for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah

Docket No. 72-22
Private Fuel Storage, L.L.C.

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards

U.S. Bureau of Indian Affairs
U.S. Bureau of Land Management
U.S. Surface Transportation Board

June 2000

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ABSTRACT

Private Fuel Storage, L.L.C. (PFS), proposes to construct and operate an independent spent fuel storage installation on the Reservation of the Skull Valley Band of Goshute Indians. The Reservation is located geographically within Skull Valley in Tooele County, Utah. Spent nuclear fuel would be transported by rail from existing power reactor sites to Skull Valley. To transport the spent nuclear fuel from the existing rail line in Skull Valley to the proposed independent spent fuel storage installation, PFS proposes to construct and operate a rail siding and 51-km (32-mile) rail line from Skunk Ridge (near Low, Utah) to the Reservation.

This draft environmental impact statement evaluates the potential environmental impacts of the PFS proposal. The document discusses the purpose and need for the PFS proposal, describes the proposed action and its reasonable alternatives, describes the environment potentially affected by the proposal, presents and compares the potential environmental impacts resulting from the proposed action and its alternatives, and identifies mitigation measures that could eliminate or lessen the potential environmental impacts.

The PFS proposal requires approval from four federal agencies: the U.S. Nuclear Regulatory Commission, the U.S. Department of Interior's Bureau of Indian Affairs and Bureau of Land Management, and the U.S. Surface Transportation Board. The actions required of these agencies are administrative. The environmental issues that each of these agencies must evaluate pursuant to the National Environmental Policy Act of 1969 (NEPA) are interrelated; therefore, the agencies have cooperated in the preparation of this draft environmental impact statement, and this document serves to satisfy each agency's statutory responsibilities under NEPA.

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µCi	micro-curies
µg	microgram
ABS	automatic block system
ACE	U.S. Army Corps of Engineers
ACEC	areas of critical environmental concern
ADT	average daily traffic
AIRS	Aerometric Information Retrieval System
ALARA	as low as reasonably achievable
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	best management practices
BNSF	Burlington Northern Santa Fe (Railway)
BWR	boiling-water reactor
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CESQG	Conditionally Exempt Small Quantity Generator
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
Ci	Curie
cm	centimeter
CO	carbon monoxide
CTC	centralized traffic control
CWA	Clean Water Act
dB(A)	decibels (on the A-weighted scale)
DEIS	draft environmental impact statement
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOT	U.S. Department of Transportation
EIS	environmental impact statement
EJ	environmental justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ER	environmental report
ERI	Energy Resources International

Fed. Reg.	*Federal Register*
FEIS	final environmental impact statement
ft	feet
FWS	U.S. Fish and Wildlife Service
g	gram
gal	gallons
gpm	gallons per minute
ha	hectare
HMP	habitat management plan
hr	hour
ICRP	International Commission on Radiological Protection
ISB	intermountain seismic belt
ISCST	Industrial Source Complex Short-Term (air dispersion model)
ISFSI	independent spent fuel storage installation
ITF	Intermodal Transfer Facility
kg	kilogram
km	kilometer
kW	kilowatt
L	liter
LCF	latent cancer fatality
L.L.C.	Limited Liability Company
LOS	level of service
m	meter
m^3	cubic meters
MEI	maximally exposed individual
MGTM	million gross ton-miles per mile
min	minute
mrem	millirem
MRS	monitored retrievable storage (facility)
MTU	metric tons of uranium
mSv	milliSievert
MWD/MTU	megawatt-days per MTU
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NMSS	Nuclear Material Safety and Safeguards
NPDES	National Pollutant Discharge Elimination System
NOI	Notice of Intent
NO_2	nitrogen oxide
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NWN	Nuclear Waste Negotiator

NWPA	Nuclear Waste Policy Act of 1982
NWPAA	Nuclear Waste Policy Amendments Act of 1987
O_3	ozone
OCA	owner-controlled area
OFF	oldest fuel first
OHV	off-highway vehicle
OSHA	Occupational Safety and Health Administration
Pb	lead
pCi	pico-Curies
PFS	Private Fuel Storage, L.L.C.
PFSF	Private Fuel Storage Facility
pH	a unit of measure for acidity (lower numbers) and alkalinity (higher numbers)
PM-10	particulate matter less than 10 microns in diameter
PMF	probable maximum flood
PNL	Pacific Northwest Laboratory
ppm	parts per million
PSD	Prevention of Significant Deterioration
PWR	pressurized-water reactor
R8W	Range 8 West
RCRA	Resource Conservation and Recovery Act
RMP	resource management plan
ROD	Record of Decision
SAR	Safety Analysis Report
SDWA	Safe Drinking Water Act
SER	Safety Evaluation Report
SHPO	State Historic Preservation Office
SLCIA	Salt Lake City International Airport
SNF	spent nuclear fuel
SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasures
STB	U.S. Surface Transportation Board
Sv	Sievert
T5S	Township 5 South
THPO	Tribal Historic Preservation Office
TLD	thermoluminescent dosimeter
UPDES	Utah Pollution Discharge Elimination System
USC	*United States Code*
UDWR	Utah Division of Wildlife Resources
VOCs	volatile organic compounds
WSA	wilderness study area
WHA	wildlife habitat area

yd^3	cubic yards
yr	year

EXECUTIVE SUMMARY

Introduction

Private Fuel Storage L.L.C. (PFS) is a limited liability company owned by eight U.S. power utilities. The members of PFS are Indiana-Michigan Power Company (American Electric Power), Consolidated Edison Company of New York, GPU Nuclear Corporation, Northern States Power Company, Illinois Power Company, Southern Nuclear Operating Company, Southern California Edison Company, and Genoa FuelTech, Inc. PFS has applied to the Nuclear Regulatory Commission (NRC) for a license to receive, transfer, and possess spent nuclear fuel (SNF) from commercial nuclear power plants at a privately owned independent spent fuel storage installation (ISFSI) [also called the Private Fuel Storage Facility (PFSF)] for the purpose of storing the SNF. PFS has identified a location for this facility on the Reservation of the Skull Valley Band of Goshute Indians (the Reservation) approximately 44 km (27 miles) west-southwest of Tooele, Utah. The proposed PFSF would be built on a 330-ha (820-acre) site about 6 km (3.5 miles) from the Skull Valley Band's village. To transport SNF through Skull Valley, PFS proposes to construct and operate a 51-km (32-mile) rail line on public land administered by the U.S. Bureau of Land Management (BLM).

This draft environmental impact statement (DEIS) was prepared by the staff of the NRC, in cooperation with the U.S. Bureau of Indian Affairs (BIA) and BLM, and the U.S. Surface Transportation Board (STB). Under the requirements of the National Environmental Policy Act of 1969 (NEPA), NRC is the lead agency for preparing the DEIS, and BIA, BLM, and STB are cooperating agencies. This DEIS has been prepared in compliance with NEPA, NRC regulations for implementing NEPA (10 CFR Part 51), the guidance provided by the Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA (40 CFR Part 1500), as well as BLM and BIA policy procedures and guidance documents, and STB regulations for implementing NEPA (49 CFR Part 1105).

This DEIS evaluates the environmental effects of the PFS proposal, including the construction and operation of new transportation facilities that would provide access to the proposed PFSF, and a consideration of alternatives to that proposal.

The Federal agencies' actions considered in this DEIS are administrative and involve decisions by each of the four agencies. NRC's action is to grant or deny a 20-year license to PFS to receive, transfer, and possess SNF on the Reservation. BIA's action is either to approve or disapprove a 25-year lease between PFS and the BIA for the Skull Valley Band for use of Reservation land to construct and operate the proposed PFSF. BLM's action is either to grant or deny one of the two requests for rights-of way, including amending the land use plan if necessary, through BLM land for transporting SNF from the existing rail line to the proposed PFSF site. STB's action is to grant or deny PFS's application for a license to construct and operate a new rail line to the proposed PFSF site.

Storage of SNF at commercial nuclear reactors sites is an increasingly important concern to the utilities operating these facilities. Some reactor owners are faced with the possibility that their facilities may be forced to halt power generation operations before their operating licenses expire because they have insufficient SNF storage capacity and no permanent SNF repository currently exists.

The purpose of the proposed PFSF is to satisfy the need for an interim facility that would serve as a safe, efficient, and economical alternative to continued SNF storage at reactor sites. PFS has indicated that such an interim facility would ensure that (1) operation of a nuclear power plant would not cease because of a lack of SNF storage capacity; (2) permanently shut-down reactors could be decommissioned sooner, resulting in a savings to the utilities and earlier use of the land for other activities; and (3) for some utilities, an economical alternative to at-reactor ISFSIs would be available. In addition, the proposed action would serve the Skull Valley Band's economic development, consistent with the BIA's trust responsibility.

U.S. nuclear power plants were not designed to store all the SNF generated throughout their operating lives. In 1977, the U.S. Department of Energy (DOE) announced that the Federal Government would accept and take title to the SNF from U.S. utilities. This policy was designed to meet the needs of nuclear reactors for both interim and permanent disposition of SNF. A permanent geological repository is projected to be completed by DOE and could begin receiving commercial reactor SNF by 2010. Before a permanent repository becomes available, however, several nuclear utilities anticipate that their on-site SNF storage capacity may become inadequate. As a result, these utilities see an interim away from reactor facility as a viable option to at reactor facilities and as a solution to their SNF storage concerns.

To date, utilities have been coping with the SNF storage problem by employing, primarily, two methods to increase on-site SNF storage capacity: (1) expanding the capacity of spent fuel pools to store SNF and (2) constructing ISFSIs at the reactor site (also called "at-reactor ISFSIs"). Although many U.S. nuclear power plants, including most of the plants owned by the PFS member utilities, have already expanded the capacity of their spent fuel pools to store SNF, several are still running out of storage space. In fact, many utilities' spent fuel pools no longer have storage space sufficient to accommodate the unloading of an entire reactor core (full core offload capability). It is projected that 80 percent of U.S. reactors will lose full core off-load capability by 2010.

This DEIS describes the proposed action; identifies reasonable alternatives, including the no-action alternative; describes the affected environment; evaluates and compares the environmental effects of the proposed action and its alternatives; and identifies mitigation measures that could eliminate or lessen the potential environmental impacts.

The Proposed Action

The proposed action involves the construction and operation of the proposed PFSF at a site (known as Site A) located in the northwest corner of the Reservation and a new rail line connecting the existing Union Pacific railroad to the site. The proposed PFSF would be designed to store up to 40,000 metric tons of uranium (MTU) of SNF. The capacity of the proposed PFSF would be sufficient to store all the SNF from the PFS member utilities, as well as SNF from utilities that are not members of PFS.

PFS's preferred option for transporting SNF from the existing railroad to the site is to build a new rail line to the site from the existing Union Pacific main rail line at Skunk Ridge (near Low, Utah) (see Figure ES.1). The proposed right-of-way for the rail corridor would be 51 km (32 miles) long and

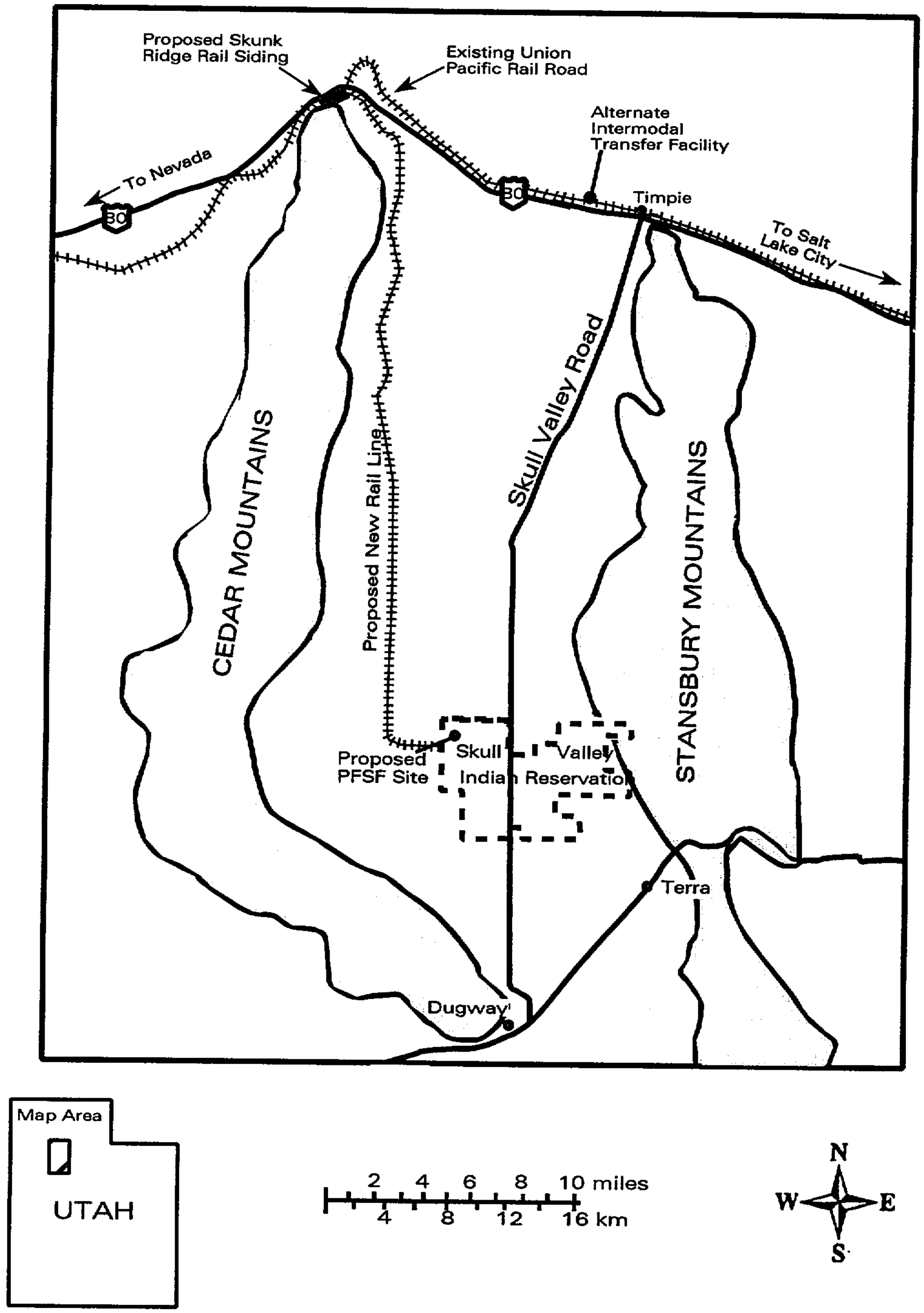

Figure ES.1. The proposed project area in Skull Valley, Utah.

60 m (200 ft) wide. It would run to the proposed PFSF site through public lands administered by BLM on the eastern side of the Cedar Mountains.

At commercial nuclear power plants, the SNF to be shipped to the proposed PFSF would be placed inside sealed metal canisters. These canisters would then be placed inside NRC-certified steel shipping casks for transport by rail to the new rail siding north of the proposed PFSF. The number of loaded spent fuel canisters (inside shipping casks) to be received at the proposed PFSF is estimated to be between 100 and 200 annually. Each canister would contain approximately 10 MTU of SNF.

At the proposed PFSF, a dry cask storage technology would be used—storing SNF inside sealed metal canisters that would be loaded into steel-and-concrete storage casks that would then be placed on concrete pads for storage. The canister-based system for confining the SNF would be certified by NRC in accordance with 10 CFR Part 72 (NRC requirements for ISFSIs). PFS proposes to employ the Holtec HI-STORM dual-purpose canister-based cask system for use at the proposed PFSF. PFS anticipates using as many as 4,000 canisters inside individual storage casks to store a maximum of 40,000 MTU of SNF.

Construction of the proposed PFSF would occur in three phases. Phase 1 construction, which would provide an operational facility, is planned to begin upon issuance of the NRC license and approval of the BIA lease and would be completed within 2 years. Approximately one-fourth of the storage area for the proposed PFSF would be constructed during Phase 1. Another one-fourth would be completed during Phase 2, with the remaining portions to be constructed during Phase 3.

Ownership and ultimate responsibility for the SNF would continue to remain with the originating utilities until the ownership of the SNF is transferred to DOE for long-term storage or disposal.

The proposed PFSF would be licensed by NRC to operate for up to 20 years and the license could be renewed. At the end of the licensed life of the proposed PFSF and prior to the expiration of the lease, it is expected that SNF would be shipped from the proposed PFSF to a permanent repository. This is consistent with the NRC's Waste Confidence Decision (55 Fed. Reg. 38474; Sept. 18, 1990), which states that at least one mined geological repository will be available before the end of 2025. In any case, the proposed lease would require removal of the SNF from the Reservation within 90 days after the lease expires.

Alternatives to the Proposed Action

In addition to the proposed action (Alternative 1) described above, this DEIS evaluates the environmental impacts of three alternative actions involving the Skull Valley site, which includes an alternative location for the PFSF on the Reservation and alternative transportation methods, as well as a no-action alternative. PFS also identified a site in Fremont County, Wyoming, as an alternative, secondary site; however, PFS has elected to pursue only the leasing and development of the Skull Valley site. The license application that is the subject of this DEIS specifically applies only to the Skull Valley site; however, NRC compares the proposed site to identified alternative sites to determine if such an alternative site is an obviously superior alternative to the proposed site (49 Fed. Reg. 9352, 9354, March 12, 1984). The Wyoming location is evaluated in this DEIS as an alternative to the site proposed in PFS's license application. These alternatives are described in the following paragraphs.

Alternative 2. This alternative involves constructing the proposed PFSF at an alternative location (Site B) on the Reservation. This site is located about 800 m (0.5 mile) south of the proposed site (Site A) and is similar in terms of its environmental characteristics to the proposed site. Under this alternative, a new rail line would be constructed from Skunk Ridge. The rail corridor through Skull Valley would be essentially identical to the one for the proposed action, but it would be about 1.6 km (1 mile) longer due to the slightly greater distance of Site B from the existing main rail line.

Alternative 3. Under this alternative, the proposed PFSF would be constructed at Site A, but transportation of SNF from the existing Union Pacific main rail line to the site would be accomplished by heavy-haul tractor/trailers. An Intermodal Transfer Facility (ITF) and rail siding would be built on land managed by BLM at the existing main rail line near Timpie, Utah, to transfer SNF shipping casks from rail cars to the heavy-haul vehicles, which would then transport the SNF along the existing Skull Valley Road to the site. No rail line would be built under this alternative.

Alternative 4. This alternative would be identical to Alternative 3 except that the proposed PFSF would be located at Site B on the Reservation rather than at Site A. The ITF and rail siding would be located near Timpie, and transport of SNF by heavy-haul vehicles would use Skull Valley Road. No rail corridor would be built under this alternative.

Wyoming site. PFS's site selection process identified a site in Fremont County, Wyoming, as a candidate site for the proposed PFSF. In this DEIS, the Wyoming site is used for comparison to the Skull Valley site. The NRC has evaluated this alternative to determine if it is obviously superior to the proposed PFSF site. The Wyoming site is located on privately owned land north of Shoshoni, Wyoming, about 39 km (24 miles) northeast of Riverton and about 9 km (6 miles) east of the Wind River Indian Reservation. The layout of the facility and its design is assumed to be similar to the proposed PFSF in Skull Valley. An existing railroad runs adjacent to the site and would require approximately 1.5 km (1 mile) of new rail construction for access to the site.

While the Wyoming site is not being actively considered by PFS for the siting of an ISFSI, it is nevertheless appropriate for use in this DEIS for comparative purposes. The proposed action under consideration in this DEIS applies only to the Skull Valley location. That is, decisions by BIA, BLM, NRC and STB regarding this proposed action do not involve the choice between the proposed site in Skull Valley and other alternative sites.

No action alternative. The no-action alternative would be not to build the proposed PFSF in Skull Valley. Under the no-action alternative, NRC would deny the application for a license for the proposed PFSF. Under the no-action alternative, no lease would be approved between PFS, BIA, and the Skull Valley Band, and the Skull Valley Band would be free to pursue alternative uses for the land in the northwest corner of the Reservation. Under the no-action alternative, no right-of-way approvals would be granted by BLM, and no amendments would be required for existing BLM Land Use Plans. The public lands administered by BLM at the proposed ITF location near Timpie, as well as at the proposed Skunk Ridge rail siding location and along the proposed Skunk Ridge rail corridor would be available for other uses compatible with existing land use plans. Under the no action alternative, STB would deny the application for a license for the proposed rail line.

Under the no-action alternative, utilities would continue to store SNF at their reactor sites either in spent fuel pools or dry casks. The potential impacts of constructing and operating the proposed

PFSF, and associated SNF transportation facilities, in Skull Valley would not occur under this alternative.

Potential Environmental Impacts

The potential environmental impacts of the proposed action and its alternatives were evaluated against standardized significance criteria. These criteria are described in the dialogue box in this section. Additional discussion of these impacts is presented below. A detailed comparison of the impacts of the alternatives is presented in Table ES.2 at the end of this Executive Summary.

DETERMINATION OF THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

A standard of significance has been established by NRC (see NUREG-1437) for assessing environmental impacts. With the standards of the Council on Environmental Quality's regulations as a basis, each impact is to be assigned one of the following three significance levels:

- ***Small.*** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- ***Moderate.*** The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- ***Large.*** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The proposed action. The proposed PFSF site in Skull Valley would occupy undeveloped rangeland which has no unique habitats, no wetlands, and no surface water bodies or aquatic resources. There would thus be no impacts to these types of resources. The nearest resident is about 3.2 km (2 miles) away to the east-southeast. Approximately 94 ha (232 acres) on the Reservation would be cleared for the proposed PFSF and its access road. Of this cleared land, 57 ha (140 acres) would remain cleared for the life of the project. The remainder of the initially cleared land would be revegetated.

The proposed new rail line in Skull Valley would cross undeveloped public rangeland administered by the BLM. Approximately 314 ha (776 acres) would be initially cleared for the new rail line's right-of-way and 63 ha (155 acres) would be cleared for the life of the project (i.e., the remainder of the initially cleared land would be revegetated). No unique habitats exist in this area. The rail route would cross 32 arroyos (i.e., gullies or gulches cut by streams with ephemeral flows) at which culverts would be installed to maintain existing drainages. Grade crossings would be provided along the rail route at the intersections of existing unimproved roads and off-road vehicle paths.

Construction of the storage pad area of the proposed PFSF would disturb the existing soil profile. Topsoil removed from the site would be used in the construction of flood protection berms and would be available for reclamation of the lease site upon termination of the facility's license. Soils used in the soil/cement mat surrounding the concrete storage pads would be permanently lost, but this accounts for a very small percentage of similar soil in Skull Valley.

Large quantities of economic geologic resources (e.g., aggregate, railbed ballast) would be required during construction of the proposed PFSF and the rail line from Skunk Ridge. The locally available quantities of these materials appear to be adequate to supply the anticipated need. No more than 60 percent of the material for any individual resource available locally from five privately owned commercial sources would be needed for construction of the proposed PFSF or rail line. Since additional sources, including publically owned sand and gravel pits managed by BLM, are located within the region, the staff concludes that the impact would be small. Mineral resources located beneath the proposed PFSF site and along the rail corridor would be unavailable for exploitation during the life of the project, however, the mineral resources at these locations are not unique and similar resources are widely available in the region.

Large quantities of water (i.e., for dust control, soil compaction, and concrete cask manufacture) would be required for construction and operation of the proposed PFSF and the rail line. Water for construction at the proposed PFSF would be supplied by new on-site wells and by tanker truck from off-site suppliers. If the new on-site wells were to prove inadequate with respect to water quality or quantity, then additional wells would be drilled in other parts of the Reservation. The impacts of withdrawing groundwater are expected to be small given the volume of water that would be withdrawn and the location of the nearest well; however, until test wells are drilled and their production capacity is checked, certainty of the impact is unknown. Water would be provided to the rail line construction sites in tanker trucks by a local vendor. PFS has contacted commercial contractors in the area and has received assurance that the required volumes of water are readily available and would not disrupt other users of water in the area.

The proposed PFSF design includes earthen berms to protect the storage pads and related facilities from flooding up to and including the proposed PFSF design basis probable maximum flood (PMF). The access road and rail line would cross channels that carry ephemeral flows during wet seasons and that would also carry surface water flow during floods. All drainage features under access route embankments, including the access road and the rail line, are designed to carry floodwater volumes that would occur during the 100-year storm event. Some portions of the access road and rail line could be inundated by as much as 1 m (3 ft) of floodwater during a flood of PMF severity. The presence of the PFSF and its access routes would not increase downstream flooding potential; however, for extreme flooding during construction, small to moderate impacts could result from soil erosion and sedimentation of surface water channels. Also, for extreme flooding during operation some temporary water ponding would likely occur upstream of the access road and railroad culverts within the floodways associated with surface water runoff channels.

The primary impact to air quality would be from dust emissions from construction areas at the Reservation site and the related transportation facilities. The temporary and localized effects of construction could produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. Air quality impacts of operation would be small. Fugitive dust emissions would be minimized by mechanical dust control measures, such as surface wetting.

Impacts, as described in Table ES.2, could occur to ecological resources from the clearing and use of land in Skull Valley. The establishment or seeding of native plant species might reduce competition from non-native annual grasses and could reduce the consequences of periodic wildfires in Skull Valley.

One state sensitive plant species, Pohl's milkvetch, is known to inhabit a region about 3.7 km (2.3 miles) southeast of the center of the proposed storage pad area. Construction and operation of the proposed PFSF are not expected to impact this region. A field survey of the proposed PFSF site did not reveal the presence of the Pohl's milkvetch. PFS intends to survey the proposed site again prior to construction. Should the Pohl's milkvetch be found in areas that could be affected by construction and operation, PFS should erect temporary fences to prevent inadvertent impacts, such as trampling, to this species.

No significant impacts to wildlife would be expected to occur during construction or operation of the proposed PFSF or its associated new rail line. The presence of these new facilities in Skull Valley would not create significant obstacles to the normal movement patterns of wildlife. Radiological doses to wildlife at the boundary of the proposed storage area would be well within acceptable levels and would not be expected to create adverse impacts. PFS has proposed monitoring and surveillance programs to prevent wildlife habitation within the storage area.

Construction of the new rail line along the western edge of Skull Valley would directly impact one cultural resource (i.e., the Hastings Cutoff Trail) that is considered eligible for listing on the National Register of Historic Places (NRHP), and may impact another (i.e., a rock cairn) that has not yet been fully evaluated. Thus, the potential impacts to cultural resources along this corridor would require mitigation prior to construction. Consultation with the State Historic Preservation Officer (SHPO) has been initiated for these resources, and a draft treatment plan to mitigate project-related impacts to the Hastings Cutoff Trail segment has been prepared that proposes photographic and historical documentation of the affected trail segment.

Historic properties known to be present at the proposed Skunk Ridge rail siding include abandoned segments of the old U.S. Highway 40, a possible segment of the older Victory/Lincoln Highway, a historic telephone line, and the historic Union Pacific Railroad with associated features including a possible historic Western Union telegraph line. None of these resources has been evaluated, though some appear to suffer from poor integrity. No cultural resources have been identified on the proposed PFSF site.

Any impacts to socioeconomic and community resources should be readily absorbed by existing services and infrastructure in the region. The notable exceptions would be (a) potential impacts to local traffic resulting from construction of the proposed PFSF and (b) disruption to and reduced availability of resources on two BLM grazing allotments. The impacts to Skull Valley Road may involve a 175-percent increase in daily use during the first phase of construction of the proposed PFSF. Consideration should be given to avoiding or minimizing such impacts by appropriately scheduling the proposed PFSF-related traffic. The impacts to grazing resources would result from the proposed rail route cutting through pasture and allotment division fences that separate grazing herds and separate some grazing areas from livestock watering sources. Consideration should be given to the installation of appropriate cattle guards and gates, as well as to providing new water sources, to ensure that livestock watering sources are accessible on both sides of the rail routes.

Beneficial effects of the proposed action on the local economic structure would result from the creation of approximately 255 jobs during the peak of construction. Many of these jobs are likely to be filled by workers from Tooele County or from other counties within commuting distance. In addition to jobs, it is expected that construction and operation of the proposed facility would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. Also, there would be a large benefit to the Skull Valley Band in the form of lease payments for the duration of the lease.

Additional beneficial impacts on the local economic structure during the operational life of the proposed PFSF would include county tax payments, local payroll, and other local expenditures. Tax payments to Tooele County have been estimated to be $92.1 million over the life of the PFSF. Local payroll during operation of the proposed PFSF has been estimated to be $81 million (based on PFS's estimate of actual staff positions and anticipated pay for each position, including benefits). Other local expenditures, including operations support and utilities, have been estimated to be $79 million over the life of the facility (based on PFS's estimate of the number of personnel involved, number of buildings, and the estimated utility loads for these buildings). In addition to impacts to the local economic structure, operation of the proposed PFSF would result in tax payments to the State of Utah, estimated to be $53.5 million.

Potentially adverse impacts to the scenic qualities of Skull Valley would occur because the proposed PFSF would be the only development in the largely undeveloped valley. To the extent practicable, PFS should use color schemes and landscaping techniques which would blend its facilities with the surrounding land colors. While the Skull Valley Band has the option of retaining any or all the buildings and other improvements once the radiological decommissioning is completed, PFS has stated that it would be willing to remove the facility and related infrastructure at the end of the license period. PFS may be required to do so at the end of the lease period, at the discretion of the Skull Valley Band and the BIA. This would be an important measure for restoring the scenic qualities of Skull Valley.

Radiological impacts from SNF stored in Skull Valley would be small. Dose calculations for the boundary of the facility indicate that a hypothetical individual located at this point for 2,000 hours each year would receive a dose not more than a small fraction of the normal background radiation dose in the United States. Doses to workers would be administratively controlled to levels below NRC's regulatory limits.

Radiological doses to the public along SNF transportation routes to Skull Valley would be small and controlled by regulatory restrictions placed upon the dose rates of the licensed shipping casks to be used. Doses to train crews and workers would be administratively controlled to acceptable regulatory levels.

Use of the proposed PFSF site (i.e., Site A) would result in the least radiological impact from routine operation among all alternatives considered because the resident nearest [i.e., 3.2 km (2 miles) away] to the proposed site is located farther away than if the facility were located at the alternative Site B [i.e., 3.1 km (1.9 miles)] or in Wyoming [i.e., 1.4 km (0.85 mile)]. The radiation doses from transportation using the proposed rail line would be less than the doses from the use of the ITF and heavy-haul vehicles on Skull Valley Road.

The proposed site (Site A) versus the alternative site (Site B) in Skull Valley. There are three notable differences between Sites A and B on the Reservation: (1) Site B lies farther from existing rail services; hence, about 10 ha (24 acres) more land would be needed for construction of a new rail line in Skull Valley, (2) Site B lies slightly closer to the location of the resident nearest to the proposed PFSF, and (3) Site B is located closer to known populations of the rare Pohl's milkvetch (a plant species). Potential impacts to this species from trampling or damage from construction vehicles would be slightly greater if the PFSF were constructed at Site B than at Site A. Each of these differences would give rise to greater impacts at Site B than at Site A. Nevertheless, the respective impacts of the use of Site A and Site B are considered to be largely indistinguishable.

The ITF transportation option. Construction of an ITF near Timpie would involve 4.5 ha (11 acres) of previously disturbed land that lies between the existing Union Pacific Railroad and Interstate 80. The ITF would include three new rail sidings, a new access road for heavy-haul vehicles, and a building with a crane for transferring SNF shipping casks from railcars onto heavy-haul trailers. The impacts from constructing these facilities would be small.

PFS proposed to use heavy-haul vehicles with dozens of tires that would distribute the vehicle's load over a large surface area. Special permits would be required from the state of Utah because of the size and weight of these heavy-haul vehicles; however, PFS has indicated that the existing Skull Valley Road is capable of handling the proposed heavy-haul vehicles without any road improvements or upgrades. Therefore, there should be no impacts to the physical integrity of Skull Valley Road from the use of such vehicles.

The use of heavy-haul vehicles moving SNF would produce only a small increase in the daily use of Skull Valley Road; however, the impacts to other traffic from these large, slow-moving heavy-haul vehicles might be difficult to mitigate. Consideration should be given to avoiding or minimizing such impacts by appropriate scheduling of the proposed PFSF-related traffic.

Workers at the ITF would receive additional radiological doses (i.e., doses beyond what would accrue during the use of the proposed rail line from Skunk Ridge) during the transfer of SNF shipping casks from rail cars onto heavy-haul trailers. PFS currently proposes to use the same workers that handle SNF at the proposed PFSF to transfer SNF from railcars to heavy haul vehicles at the ITF. Based on current projections, the doses received by these workers would exceed the 5 rem occupational exposure limit in 10 CFR Part 20. PFS would be required to ensure that the occupational exposure limit is not exceeded; therefore, PFS would be required to take additional measures to reduce individual doses to acceptable levels. Although these doses would be administratively controlled to comply with NRC regulatory limits, the lower doses associated with the Skunk Ridge rail line would be preferable to those resulting from the ITF alternative.

Table ES.1 summarizes the significance levels of the combined potential impacts for the Skull Valley alternatives addressed in this DEIS.

The Wyoming alternative. Table ES.2 includes a comparison of the potential impacts of constructing and operating an SNF storage facility (and its associated transportation facilities) in Wyoming with those of such a facility in Skull Valley, Utah. Note that NRC has no authority to decide the location of the proposed PFSF; NRC's decision is either to grant or deny PFS's application for a license for the Skull Valley location. The Wyoming site is evaluated in this DEIS for the purpose of comparing potential impacts of that site to those of the proposed PFSF in Skull Valley. Because a detailed design for an ISFSI in Wyoming does not exist, and because the Wyoming site has not been studied in as great detail as the Skull Valley site, an exact one-to-one comparison of potential impacts is not possible for each resource category. The conclusions regarding the evaluation of the Skull Valley site versus the Wyoming site are therefore made from the perspective of determining whether the Wyoming site is obviously superior to the Skull Valley site, if the proposed PFSF were to be constructed and operated there.

With two possible exceptions, the potential impacts for an SNF storage facility at the site in Fremont County, Wyoming, would be similar to those for the proposed PFSF in Skull Valley. The

Table ES.1. Summary of significance levels of the combined potential impacts for the Skull Valley alternatives addressed in this DEIS

Potentially impacted resource or category	Proposed action (i.e., Site A with the rail corridor)	Site B with the rail corridor	Site A with the ITF	Site B with the ITF
Geology, minerals, and soils	SMALL	SMALL	SMALL	SMALL
Water resources				
Surface water	SMALL	SMALL	SMALL	SMALL
Flooding	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Water use	SMALL	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL
Air quality	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Ecological resources				
Vegetation	SMALL	SMALL	SMALL	SMALL
Wildlife	SMALL	SMALL	SMALL	SMALL
Wetlands	SMALL	SMALL	SMALL	SMALL
Perennial and ephemeral streams	SMALL	SMALL	SMALL	SMALL
Threatened and endangered species	SMALL	SMALL	SMALL	SMALL
Socioeconomics and community resources				
Human population	SMALL	SMALL	SMALL	SMALL
Housing	SMALL	SMALL	SMALL	SMALL
Education	SMALL	SMALL	SMALL	SMALL
Utilities	SMALL	SMALL	SMALL	SMALL
Solid and sanitary waste	SMALL	SMALL	SMALL	SMALL
Traffic	MODERATE TO LARGE	MODERATE TO LARGE	MODERATE TO LARGE	MODERATE TO LARGE
Economic structure[a]	MODERATE TO LARGE (but beneficial)	MODERATE TO LARGE (but beneficial)	MODERATE TO LARGE (but beneficial)	MODERATE TO LARGE (but beneficial)
Land use (including rangeland)	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Cultural resources	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL

Table ES.1. Continued

Potentially impacted resource or category	Proposed action (i.e., Site A with the rail corridor)	Site B with the rail corridor	Site A with the ITF	Site B with the ITF
Human health impacts				
Non-radiological risks to workers	SMALL	SMALL	SMALL	SMALL
Radiological doses to the public	SMALL	SMALL	SMALL	SMALL
Radiological doses to workers	SMALL	SMALL	SMALL TO MODERATE	SMALL TO MODERATE
Radiological non-transportation accidents	SMALL	SMALL	SMALL	SMALL
Transportation of SNF	SMALL	SMALL	SMALL	SMALL
Radiological transportation accidents	SMALL	SMALL	SMALL	SMALL
Non-radiological transportation accidents	SMALL	SMALL	SMALL	SMALL
Noise	SMALL	SMALL	SMALL	SMALL
Scenic qualities	MODERATE	MODERATE	MODERATE	MODERATE
Recreation	SMALL	SMALL	SMALL	SMALL
Environmental justice	SMALL	SMALL	SMALL	SMALL

[a]Economic benefits to the Skull Valley Band would be large.

exceptions include impacts associated with the local transportation options and impacts to the Skull Valley Band. Each of these exceptions is discussed below.

The Wyoming site would cause fewer impacts than the Skull Valley site in regard to land use and the required amounts of construction materials related to the construction of a new rail access corridor. Because of the greater distance from existing rail service in Skull Valley, significantly larger amounts of land, which is public land administered by the BLM, would be needed for a new rail transportation corridor in Skull Valley than for the Wyoming alternative (which lies entirely on privately-owned land). The Wyoming site would require only about 1.6 km (1 mile) of new rail line, compared to 51 km (32 miles) in Skull Valley. The other impacts of constructing a new rail line in Skull Valley would also be absent for an SNF storage facility at the Wyoming site. These impacts include the use of railbed ballast and aggregate, as well as the increased road use of vehicles transporting these construction materials.

If the proposed PFSF were not constructed on the Reservation, then its positive economic benefits would not accrue to the Skull Valley Band. The Skull Valley Band would be free to pursue other uses for their land, but would lose opportunities for employment, as well as the financial gain from the proposed lease revenue.

In regard to all other potentially affected resources, the Skull Valley site does not appear to be appreciably different from the Wyoming site. While the impacts of building the rail line in Skull Valley are greater than those for the rail construction at the Wyoming site, these impacts, when considering mitigation recommended by the cooperating agencies, would not be large. In addition, the location of the ISFSI in Wyoming would not have any positive socioeconomic effects on the Skull Valley Band. Accordingly, the NRC staff concludes that the Wyoming site is not obviously superior to the proposed site (i.e., Site A) in Skull Valley.

No-action alternative. The no-action alternative would be not to build the proposed PFSF. The potential impacts of the proposed action would not occur under this alternative. While the no-action alternative would avoid the impacts to Skull Valley, it could lead to impacts at other locations. The two most likely no-action scenarios involve (1) the continued accumulation of SNF in existing at-reactor storage facilities and (2) construction of new or expanded at-reactor SNF storage facilities. In either scenario, SNF would continue to be stored at reactor sites until it is shipped to the DOE permanent geological repository.

If no additional SNF storage capacity is constructed, SNF would continue to accumulate at nuclear power plants where it is being generated. Most SNF is currently being stored in spent fuel pools that were built into reactor facilities. Some power reactor licensees have expanded the capacity of their pool storage to accommodate the accumulated SNF. A few have built at-reactor ISFSIs to store their SNF in dry casks using a technology similar to what is proposed for Skull Valley. Some power reactor licensees, however, because of physical constraints (e.g., insufficient land) may have to terminate operations prior to the expiration of their reactor license if their available spent fuel storage capacity is filled.

The NRC has examined, in support of other agency actions, the environmental impacts of at-reactor ISFSIs. In support of its Waste Confidence Decision, the NRC has examined the environmental impacts of the operation of ISFSIs built at operating nuclear power plant sites. The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored without significant environmental impacts for at least 30 years beyond the licensed life for operation of that reactor at on-site or off-site ISFSIs (10 CFR 51.23; 49 Fed. Reg. 34688, Aug. 31, 1984). The NRC has reviewed the Waste Confidence decision twice since it was first issued [in 1990 (55 Fed. Reg. 38474, Sept. 18, 1990) and in 1999, (64 Fed. Reg. 68005, Dec. 6, 1999)], and in both cases, the Commission basically reaffirmed the findings of the original decision. On July 18, 1990, the NRC published a final rule on "Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites" (55 Fed. Reg. 29181–29190, July 18, 1990), and issued a general license for storage of SNF at reactor sites (10 CFR 72.210). The environmental impacts of SNF storage at reactor sites were also addressed in an environmental assessment and its accompanying "finding of no significant impact" (NRC 1989). The finding of no significant impact states that:

> *[T]he Commission concludes that this proposed rulemaking, entitled "Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites" will not have a significant incremental effect on the quality of the human environment.*

In addition, the NRC has issued eight site specific licenses for at reactor ISFSIs located in various parts of the country. For all eight ISFSIs, an environmental assessment was completed and a finding of no significant impact was reached. For the no action alternative with respect to the proposed PFSF, the staff assumes that at-reactor ISFSIs would be constructed at reactor sites where additional storage capacity is needed and where physical constraints, such as available land at the reactor site, do not preclude the construction or operation of an ISFSI. The staff also assumes that the design, construction, and operation of future ISFSIs would be similar to that of existing ISFSIs.

While a detailed examination of each reactor site where an at-reactor ISFSI could be built has not been completed, the staff does not expect, based on the previous NRC studies discussed above, that the construction and operation of future at-reactor ISFSIs would result in significant environmental impacts.

If at-reactor ISFSIs are constructed, the positive economic benefits from tax revenues, local payroll, and other expenditures would not be available to the Skull Valley Band, but the Skull Valley Band would be free to pursue other uses for its land.

Summary of the Costs and Benefits of the Proposed Action

Economic costs and benefits. The computation of the economic benefit for the proposed action has two parts, namely: (1) the costs of storing SNF at existing reactor sites that can be avoided due to the availability of the additional storage capacity at the proposed PFSF, and (2) the costs of constructing and operating the proposed PFSF. The net economic benefit of the proposed action is the mathematical difference between these costs. A positive value indicates that the costs associated with the proposed PFSF are less than the costs associated with at-reactor storage.

From an economic perspective, the net benefit of the proposed PFSF is directly proportional to the quantity of SNF shipped to the facility. Most scenarios evaluated by the staff indicate the potential for a net positive benefit. Situations in which the proposed PFSF is assumed to have a relatively small SNF throughput have the least promising economic benefit. The net economic benefits of the proposed PFSF are sensitive to several factors that are inherently uncertain. An analysis of the sensitivity of the potential net economic benefits to critical cost assumptions indicates the possibility of considerable variation in outcome. Notwithstanding the sensitivity of the benefits to these factors, cases in which the proposed PFSF has a capacity of at least 16,000 MTU have a greater likelihood of positive net benefits.

Environmental benefits and costs of the proposed action. The NRC has previously reached the overall conclusion that the environmental effects of building at-reactor ISFSIs are not significant, although the overall environmental impacts are not zero. Use of the proposed PFSF would reduce the already small environmental effects of spent fuel storage at reactor sites.

The Skull Valley Band would benefit from the lease payments for use of their land, and from employment opportunities associated with construction and operation of the proposed PFSF. Additional financial resources for the Skull Valley Band as a whole, as well as for individual members would offer expanded opportunities for social, educational and economic development.

Tooele County and other parts of Utah would also benefit economically from the monies spent buying and manufacturing items for use at the proposed facility.

If the proposed PFSF is not licensed, it could lead to termination of the power generating activities before operating license expiration at one or more nuclear power plants. This could possibly result in the increased use of fossil fuel fired power plants which could emit greater quantities of air pollutants per unit of electricity produced than nuclear plants.

The environmental costs of the proposed action are related to the impacts summarized in Table ES.1 and discussed above. The most important of these environmental costs are associated with the commitment of the tract of land in Skull Valley for the new rail line. This land would be lost for other uses until such time as the rail line was decommissioned and removed.

Additional environmental costs would be associated with the increased use of Skull Valley Road by construction workers and operations workers at the proposed PFSF. Increased road use would add to existing traffic and would produce vehicle noise audible at roadside residences.

The existing scenic qualities of Skull Valley would be changed by the presence of an industrial facility (i.e., the proposed PFSF) and the new rail line. Impacts to these scenic qualities could not completely be mitigated until the facility and rail line were eventually decommissioned and removed.

The proposed action would expose members of the public along transportation routes and the residents of Skull Valley to a small, incremental amount of radiation. These small doses represent a small fraction of the average doses already received by members of the U.S. population from naturally occurring radiation.

Other benefits and costs of the proposed action. Construction of the proposed rail line to the facility would enhance the transportation infrastructure in Skull Valley. The proposed improvements to the transportation infrastructure could make economic development of the central and southern parts of the valley more attractive. Similarly, enhancements to electric and telephone service induced by the proposed PFSF could enhance the attractiveness of the valley for other development or economic activities.

The existence of the proposed PFSF would provide an alternative to at-reactor storage and thus would help to ensure that a nuclear power plant would not have to cease operations before expiration of its operating license because of a lack of SNF storage capacity.

Before a nuclear plant site at which reactor operation permanently ceased could become available for other uses, the reactor would need to be completely decommissioned (i.e., all radioactive materials would have to be removed). As long as SNF remains in storage at the reactor, decommissioning cannot be completed. The existence of the proposed PFSF would allow licensees of shutdown reactors to complete decommissioning sooner, resulting in a cost savings to the owner and allowing earlier use of the reactor site for other purposes.

Mitigation Measures

The impact analyses contained in Chapters 4 and 5 of this DEIS have identified various mitigation measures PFS has either committed to or could take to reduce the environmental impacts associated with the proposed action. This section identifies the mitigation measures discussed in Chapters 4 and 5 that the staffs of the NRC, BIA, BLM, and STB recommend be required and included as appropriate in each agency's record of decision.

Condition 1. Best Management Practices

In addition to the Best Management Practices identified in Table 2.7 of this DEIS, the cooperating agencies staffs recommend that PFS be required to employ the following Best Management Practices for construction related to the proposed PFSF and related local transportation facilities.

A. minimize land area disturbances by disturbing the smallest practicable area of land near the ephemeral streams along the proposed rail line corridor.

B. establish staging areas for construction equipment in areas that are not environmentally sensitive to control erosion and spills.

C. control temporary noise from construction equipment through the use of work-hour controls, and the operation and maintenance of muffler systems on machinery.

Condition 2. Ecological Resources

A. Prior to initiating construction, PFS shall complete biological surveys in the locations identified below for the presence of sensitive species that may be found at those locations. When the project construction schedule is determined, PFS shall consult with BIA, the Skull Valley Band, and BLM regarding the appropriate timing of the surveys. PFS shall include the following species in the biological surveys

- Proposed PFSF site
    - Loggerhead shrike
    - Burrowing owl
    - Skull Valley Pocket Gopher
- Proposed Rail Line
    - Raptors (eagles, hawks, falcons, owls, loggerhead shrike)
    - Skull Valley pocket gopher

B. If any of the surveys required in Condition 2.A identify the presence of a sensitive species, PFS shall immediately notify the appropriate Federal agency with management responsibility (BIA or BLM).

C. If PFS identifies any Federally-listed threatened or endangered species within the proposed PFSF site area during construction, PFS shall immediately cease construction activities and notify BIA. If PFS identifies any Federally listed threatened or endangered species, or any State of Utah or BLM sensitive species during construction of the transportation facilities related to the proposed PFSF, PFS shall immediately cease construction activities and notify BLM.

D. If any Federally listed threatened or endangered species are taken by construction or operation of the proposed PFSF or its related transportation facilities, PFS shall immediately notify U.S. FWS, BIA, the Skull Valley Band, or BLM, as appropriate.

E. If any State or BLM listed threatened or endangered species are taken by construction or operation of the transportation facilities related to the proposed PFSF, PFS shall immediately notify BLM and the Utah State Department of Natural Resources.

F. PFS shall complete any necessary biological assessment activities to support NRC, BIA or BLM's consultation requirements under the Endangered Species Act of 1974, and any BLM consultation agreements with the State of Utah.

G. Prior to initiating operations, PFS shall consult with NRC, BIA and the Skull Valley Band to develop an adequate wildlife monitoring program to be implemented during operation of the proposed PFSF.

H. Prior to initiating construction, PFS shall consult with BIA and BLM to develop an adequate plan for restoring and revegetating areas affected by construction of the proposed PFSF and related rail transportation facilities. (Includes greenstrip seed mix specifications)

I. Prior to initiating construction, PFS shall consult with BIA and BLM to develop an adequate plan for controlling noxious weeds during construction and operation of the proposed PFSF and related rail facilities. The plan should also include an approved list of herbicides.

J. Prior to initiating construction, PFS shall consult with BIA and BLM to develop an adequate plan for fire prevention, suppression, and rehabilitation during construction and operation of the proposed PFSF and related rail facilities.

K. Prior to construction of the rail line, PFS shall consult with BLM to determine the appropriate design, number, and locations for rail crossings to allow fire suppression equipment to cross the rail line.

L. PFS shall consult with BLM to develop an adequate plan to minimize impacts to livestock grazing activities during construction and operation of the rail facilities.

M. PFS shall ensure power poles and lines on the proposed PFSF are constructed to either conform to the guidance in "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996," or more recent guidance as determined by BIA.

Condition 3. Cultural Resources

A. Before beginning construction of a rail line from Skunk Ridge to the Reservation, PFS shall implement all the mitigation included in the Memorandum of Agreement (MOA) developed through the Section 106 consultation process.

B. If PFS identifies any buried artifacts or other cultural resources during construction activities on land under the jurisdiction of BLM, PFS shall immediately cease construction, inform BLM of the identified resources, and arrange for evaluation of the resources by a qualified individual. The qualified individual may be employed by BLM or the SHPO, or may be retained by PFS.

C. If PFS identifies any buried artifacts or other cultural resources during construction activities on the Reservation, PFS shall immediately cease construction, inform BIA and the Skull Valley Band of the identified resources, and arrange for evaluation of the resources by a qualified individual. The qualified individual may be employed by BIA or the SHPO, or may be retained by PFS.

D. A qualified individual shall evaluate any resources identified during construction pursuant to conditions 3.B and 3.C and shall recommend whether such resources are eligible for listing under the National Historic Preservation Act of 1966 (NHPA).

E. If resources eligible for listing under the NHPA are identified pursuant to condition 3.D, PFS shall describe, in detail, their characteristics and take the appropriate mitigation measures determined through NHPA required consultation.

F. Upon providing a description of cultural resources required pursuant to Condition 3.E to BLM or upon a BLM determination that cultural resources identified during construction on lands under the jurisdiction of BLM are not eligible for listing under the NHPA, PFS may resume construction on such lands.

G. Upon providing a description of cultural resources required pursuant to Condition 3.E to BIA or upon a BIA determination that cultural resources identified during construction on the Reservation are not eligible for listing under the NHPA, PFS may resume construction on the Reservation.

Condition 4. Air Quality

To control fugitive dust during construction, PFS shall implement a dust control program to minimize the off-site movement of fugitive dust. The program shall include measures to minimize dust emissions from construction and earthmoving activities (for both the proposed PFSF site and the new transportation facilities), the concrete batching facility, material transfer points and stockpiles, and temporary or permanent flood protection berms.

Condition 5. Water Resources

A. PFS shall design all culverts and crossings of intermittent streams along the rail line to minimize the potential for ponding, erosion, and sedimentation by matching the existing topography.

B. Prior to initiating construction, PFS shall develop a monitoring program to determine if the wells nearest the proposed PFSF are adversely impacted from groundwater withdrawal associated with the construction and operation of the proposed PFSF.

C. PFS shall prepare a spill prevention, control and countermeasure plan for the transportation facilities. The plan must be similar to the SPCC for the proposed PFSF, which must be approved by the U.S. EPA.

D. PFS shall develop a maintenance plan to ensure all culverts are clear of debris to avoid potential flooding and stream flow alteration.

Condition 6. Traffic

If PFS determines that continual use of the unimproved roads adjacent to the proposed rail line is necessary to transport either workers or materials, PFS shall consult with BLM to develop an adequate plan to minimize any degradation of the roads. BLM shall be contacted prior to any use of the unimproved roads that could lead to their degradation.

Condition 7. Construction Training

Prior to initiating construction, PFS shall identify and train on-site personnel responsible for ensuring that construction activities do no disturb sensitive ecological and cultural resources. PFS shall further ensure that all on-site construction workers are trained on potential sensitive ecological and cultural resources that could occur at the construction sites.

Condition 8. Monitoring and Reporting

A. PFS shall provide quarterly reports on compliance with the required construction-related mitigation conditions to the NRC, BLM, BIA, the Skull Valley Band, and STB.

B. PFS shall certify compliance with all construction mitigation conditions to NRC, BLM, BIA, the Skull Valley Band, and STB (1) at the completion of the rail facility construction and before initiating rail operations and (2) at the completion of the site and access road construction and before initiating operations of the PFSF.

Staff's Recommendation of the Preferred Alternative

The environmental review staff from the NRC, BIA, BLM, and STB have concluded that (1) measures required by Federal and State permitting authorities other than the cooperating agencies, and (2) mitigation measures that the cooperating agencies recommend be required would reduce any short- or long-term adverse environmental impacts associated with the proposed action to acceptable levels. In addition, after completion of the project and termination of the NRC license and the BIA lease, the closure and decommissioning activities proposed by PFS would make the project area available to other uses, including further economic development in Skull Valley or other uses by the Skull Valley Band.

The staff has concluded that the overall benefits of the proposed PFSF outweigh the disadvantages and costs, based upon consideration of:

- the need for an alternative to at-reactor SNF storage that provides a consolidated, and for some utilities, economical storage capacity for SNF from U.S. power generating reactors,
- the minimal radiological impacts and risks from transporting, handling, and storing the proposed quantities of SNF,
- the economic benefits that would accrue to the Skull Valley Band during the life of the project, in addition to the economic benefits to the workers (through payroll), to local vendors (through purchases of materials and services), and to the State and local governments (through tax revenues), and
- the absence of significant conflicts with existing resource management plans or land use plans within Skull Valley.

Furthermore, the use of a new rail line from Skunk Ridge would have advantages over the use of a new ITF near Timpie in combination with Skull Valley Road to transport SNF to the PFSF. The impacts to local traffic on Skull Valley Road due to the presence of slow moving heavy-haul vehicles would be difficult to mitigate. The use of the new rail line from Skunk Ridge would avoid any such impacts to local vehicular traffic. Also, additional doses would be incurred by workers transferring

SNF shipping casks from railcars to heavy-haul vehicles at the ITF. These doses could be avoided altogether if the Skunk Ridge rail option were used instead of the ITF option.

The preferred alternative of the NRC is the proposed action, which includes NRC's issuing a license to PFS to receive, transfer, and possess SNF at a location in the northwest corner (i.e., at Site A) of the Reservation, BLM's approving the right-of-way and land use plan amendment for the use of public lands administered by the BLM for a new rail line, and STB's licensing the construction and operation of a new rail line to be routed along the western side of Skull Valley and connected with the existing Union Pacific Railroad at a new siding near Skunk Ridge, Utah. A BLM decision to grant a right-of-way to PFS would be dependent upon the decisions made by the NRC and BIA. If the NRC issues a license to PFS for the proposed PFSF and BIA approves the lease, then BLM's preferred alternative would be to amend the Pony Express Resource Management Plan and issue a right-of-way for the Skunk Ridge rail siding and rail line. Absent such findings by the NRC and BIA, BLM would not grant either of PFS's rights-of-way requests. Based on the information and analysis to date, the STB environmental review staff's preliminary conclusion is that the proposed project, with implementation of the cooperating agencies recommended mitigation measures, would not result in significant adverse impacts to the environment, therefore, its preferred alternative would be to recommend approval of the construction and operation of the proposed rail line. The BIA does not have a preferred alternative but will choose one in the Final EIS based upon its trust responsibility to the Skull Valley Band, including consideration of environmental impacts and mitigation measures identified in this DEIS and public comments on the DEIS.

Table ES.2. Summary and comparison of potential environmental impacts

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Geology, Minerals, and Soil					
SMALL. Impacts to soils and economic geologic resources could occur from construction and operation of the proposed PFSF and the rail line. A small percentage of the soils in the valley would be permanently lost in the soil/cement mixture. Excess soils would not be generated. Aggregate materials used for construction are readily available locally and would be recoverable in decommissioning. Underlying mineral resources would be unavailable during operation.	The impacts for this alternative are considered similar to those identified for the proposed action.	Less aggregate would be required for construction of the ITF than the new rail line. These materials are readily available locally and would be recoverable on decommissioning.	The impacts for this alternative are considered similar to those identified for Alternative 3.	Like the preferred site (Site A) impacts to soils and economic geologic resources will occur. Because a much shorter rail line is required, soils disturbance and geologic resource commitments would be less than at the preferred site. Impacts from the unavailability of mineral resources beneath the site is the same as for the preferred site.	Construction or expansion of at-reactor storage facilities would involve negligible commitments of land that is already under the control of the owner of the associated nuclear power plant.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Surface Water					
SMALL. Some modification of surface drainage patterns could occur; however, there would be no adverse effects during normal weather conditions.	The impacts for this alternative are considered similar to those identified for the proposed action.	Little modification of the existing surface drainage system would be required at the ITF. Surface water impacts would be less than for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	There would be less interaction of the site footprint and access routes with surface runoff channels at the Wyoming site as compared to the Skull Valley site.	Construction or expansion of at-reactor SNF storage facilities would occur on sites previously disturbed by the construction of the nuclear power station; hence, no impacts to water resources would be expected.
Flooding					
SMALL TO MODERATE. Severe flooding conditions, if they occur during construction of the proposed PFSF, could cause erosion of disturbed soil and unvegetated embankments and would create downstream siltation. Potential impacts to the rail line under severe flooding events would be similar to those described above for the proposed PFSF.	The impacts for this alternative are considered similar to those identified for the proposed action.	No flooding potential exists at the ITF site. Less possibility of flood-related effects on transportation facilities if the ITF is constructed instead of the rail line.	The impacts for this alternative are considered similar to those identified for Alternative 3.	Potentially smaller impacts from watershed-scale flooding than at the Skull Valley site.	Site-specific SERs address flooding concerns. Expanded storage or new storage facilities would be subjected to NRC safety reviews and regulations.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Water Use					
SMALL. Most water required for construction would be purchased from commercial suppliers. On-site groundwater use would involve small quantities during operation.	The impacts for this alternative are considered similar to those identified for the proposed action.	Avoidance of rail line construction would reduce water use by more than 13,000 m^3 (50 million gallons).	The impacts for this alternative are considered similar to those identified for Alternative 3.	Less water would be required for construction at the Wyoming site because of a much shorter rail access corridor than in Skull Valley.	Water requirements for reactor cooling and SNF pool storage operations would continue. Additional water requirements for the expansion or construction of new storage facilities would be expected to be small.
Groundwater					
SMALL. Little to no potential for impacts to other groundwater users or to groundwater quality.	The impacts for this alternative are considered similar to those identified for the proposed action.	Impacts would be similar to those of the proposed action except that effects of accidental spills along rail line construction corridor would be eliminated.	The impacts for this alternative are considered similar to those identified for Alternative 3.	Residential wells are known to exist within 1 mile of the Wyoming site. Groundwater quantity may be affected.	Construction or expansion of at-reactor SNF storage facilities would occur on sites previously disturbed by the construction of the nuclear power station; hence, no impacts to water resources would be expected.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Air Quality					
SMALL TO MODERATE. Large amounts of fugitive dust from earth disturbance would occur during construction of the proposed PFSF, and of the rail line where it runs close to Interstate 80. Air quality impacts would be small for the proposed PFSF, and moderate (similar to a large road construction project) for the rail line construction near Interstate 80, where small effects might be experienced by large numbers of people. Air quality impacts during operation from up to two locomotives, vehicles, and a backup generator would be small.	The impacts for this alternative are considered similar to those identified for the proposed action.	The air quality impacts for the proposed PFSF would be the same as the proposed action; however, the ITF precludes the need to construct a rail line to the storage site. Air quality impacts of constructing a rail line near Interstate 80 would be eliminated. Air quality impacts of constructing an ITF would be less than for a rail line due to the much smaller area that would be disturbed.	The impacts for this alternative are considered similar to those identified for Alternative 3.	Impacts at the Wyoming site are likely to be greater than any at either of the Skull Valley sites due to the proximity of construction areas to the nearest residence and a population center.	Some local air-quality impacts would be likely near existing nuclear stations if at-reactor facilities need to be expanded; however, these impacts would be expected to be small.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Terrestrial Ecology					
Vegetation. SMALL. Clearing of approximately 408 ha (1,008 acres) of land for construction of the proposed PFSF and associated rail line would result in loss of existing degraded desert shrub/saltbush vegetation dominated by non-native cheatgrass. About 71 percent of this area would be replanted with native species or crested wheatgrass.	The impacts to vegetation at Site B would be similar to those for Site A. An additional 10 ha (24 acres) of existing vegetation would be lost by construction of the rail corridor. This additional loss would not affect any unique or sensitive plants or plant communities.	The impacts to vegetation at Site A would be similar to those for the proposed action. The construction of the ITF at Timpie would result in clearing only 4.5 ha (11 acres) of disturbed vegetation. The total area cleared, 98.5 ha (243 acres), would be much less than for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to vegetation for a facility in Wyoming would be similar to those for a facility in Skull Valley. The amount of vegetation disturbed by clearing would be less than for the proposed action because the rail line would be shorter.	Site-specific disturbance of existing plant communities may occur. Where storage could be expanded only within existing facilities, impacts to vegetation would be expected to be small. If new SNF storage facilities are constructed in the vicinity of existing reactor structures and minimal land disturbance is required, impacts on vegetation would be minimal.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Wildlife. SMALL. Construction of the proposed PFSF and rail line would disturb 408 ha (1,008 acres) of wildlife habitat, but 71 percent of this area would be re-planted to native species and crested wheatgrass which may provide improved habitat for some species. Fences around the proposed PFSF would be expected to alter movement patterns of larger animals, but such impacts should be small if BLM-recommended mitigation to provide crossings of the rail line are implemented. Impacts of operation of the proposed PFSF could result in radiation exposure to some species.	The impacts to wildlife at Site B would be similar to those for Site A. An additional 10 ha (24 acres) of existing wildlife habitat would be lost by construction of the rail corridor. This additional loss would not affect any unique or sensitive habitat.	The impacts to wildlife at Site A would be similar to those for the proposed action. The construction of the ITF near Timpie would result in loss of only 4.5 ha (11 acres) of disturbed habitat. The impacts of the rail corridor on wildlife movement and habitat would not occur.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to wildlife for a facility in Wyoming would be similar to those for a facility in Skull Valley. Wildlife species that are present on the Wyoming site are similar to those at Skull Valley and would be affected in similar ways. Less wildlife habitat would be affected because of the shorter rail access corridor.	Site-specific disturbance of existing wildlife habitats may occur. Where storage could be expanded only within existing facilities, impacts to wildlife habitats would be expected to be small. If new SNF storage facilities are constructed in the vicinity of existing reactor structures and minimal land disturbance is required, impacts on wildlife would be minimal.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Wetlands. SMALL. No impacts to wetlands from construction of the proposed PFSF are anticipated because there are no wetlands on or near the preferred site or in the vicinity of the rail line and siding. A potential small impact to wetlands around Horseshoe Springs could result from increased recreational use.	The impacts to wetlands would be similar to those of the proposed action because no wetlands are present in areas affected by the project.	The impacts to wetlands would be similar to those of the proposed action because no wetlands are present in areas affected by the project.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to wetlands for a facility in Wyoming would be similar to those for a facility in Skull Valley. One wetland is known to occur on the Wyoming site, but it could be avoided if the project were to be located there.	Site-specific disturbance of existing wetlands may occur. Where storage could be expanded only within existing facilities, impacts to wetlands would be expected to be small. If new SNF storage facilities are constructed in the vicinity of existing reactor structures and minimal land disturbance is required, impacts on wetlands would be minimal.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Perennial and Ephemeral Streams. SMALL. No impacts to streams are expected to occur on the proposed PFSF site because there are no streams present. Because the proposed rail corridor would cross 32 streams with ephemeral flows, it is possible, depending on the time of year that construction occurs, that disturbed soils could create small short-term increases in the turbidity of any water in such streams. Such impacts are expected to be small.	The impacts to perennial and ephemeral streams would be similar to those of the proposed action because no additional streams are present on Site B or the additional area needed for the rail corridor.	The impacts to perennial and ephemeral streams would be much less than under the proposed action because there would be no new crossings of the 32 ephemeral streams along the rail corridor. No streams would be affected by construction and operation of the ITF near Timpie.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to perennial and ephemeral streams for a facility in Wyoming would be similar to, those for a facility in Skull Valley. Two ephemeral streams occur near the Wyoming site and two or three dry washes are within 1.6 km (1 mile) of the site.	Site-specific disturbance of existing streams may occur. Where storage could be expanded only within existing facilities, impacts to streams would be expected to be small. If new SNF storage facilities are constructed in the vicinity of existing reactor structures and minimal land disturbance is required, impacts on perennial or ephemeral streams would be minimal.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Threatened and Endangered Species. SMALL. No Federally or State-listed threatened or endangered plant species are known to occur on the proposed PFSF site or rail line. Federally and State-listed raptors and the listed loggerhead shrike are potentially present in Skull Valley. Pohl's milkvetch, a State plant species of concern, is potentially present near the site. PFS intends to survey the site again to determine whether these species are present and take measures as necessary to avoid or minimize any impact before construction was initiated. Habitat for the BLM-listed kit fox is present along the Skunk Ridge rail line. However, since the amount of habitat is a very low percentage of the available habitat in Skull Valley, impacts to this fox are predicted to be small.	The impacts to threatened and endangered species and State species of concern for a facility located at Site B would be similar to those for a facility at Site A, although an additional 10 ha (24 acres) of potential habitat for such species would be disturbed.	The impacts to threatened and endangered species and State species would be similar to those of the proposed action, except that less habitat for species potentially present in the area would be disturbed and potential habitat for the BLM-listed kit fox would not be affected.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to threatened and endangered species and State species of concern for a facility in Wyoming would be similar to those for a facility in Skull Valley. Owl Creek miner's candle, a plant species which has a declining population occurs in the general area of the site, and the ferruginous hawk, a State-listed species in Wyoming, is reported to use the site.	Site-specific disturbance of existing plant and/or wildlife habitats may occur. Where storage could be expanded only within existing facilities, impacts to threatened or endangered species would be expected to be small. If new SNF storage facilities are constructed in the vicinity of existing reactor structures and minimal land disturbance is required, impacts on threatened or endangered species would be minimal.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Socioeconomics and Community Resources					
Population. SMALL. The total increase in population amounts to approximately 0.6 percent of Tooele County's 1996 population during construction and less than that during operations.	The impacts for this alternative are considered similar to those identified for the proposed action.	The total increase in population amounts to approximately 0.4 percent of Tooele County's 1996 population. This is approximately two-thirds of the population increase associated with construction activities for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to population of constructing and operating a facility at the Wyoming site are expected to be quantitatively similar to those at the remote Skull Valley site.	The potential effects on population would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.
Housing. SMALL. The total increase in housing requirements amounts to approximately 26 percent of vacant housing units for sale or rent in 1990 for Tooele County during construction and approximately one-half that proportion during operations.	The impacts for this alternative are considered similar to those identified for the proposed action.	The increase in housing requirements would be less for this alternative (i.e., approximately 17.2 percent of vacant housing units) than the proposed action because fewer workers would be needed during construction.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to housing of constructing and operating a facility at the Wyoming site are expected to be quantitatively similar to those at the remote Skull Valley site.	The potential effects on housing would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Education. SMALL. The total increase in school-age children amounts to approximately 0.5 percent of the enrollment in 1997 for Tooele County during construction and somewhat less than that during operations.	The impacts for this alternative are considered similar to those identified for the proposed action.	The increase in school-age children would be less for this alternative (i.e., approximately 0.3 percent of existing enrollment) than the proposed action because fewer workers would be needed during construction.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to education of constructing and operating a facility at the Wyoming site are expected to be quantitatively similar to those at the remote Skull Valley site.	The potential effects on education would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.
Utilities. SMALL There may be some improvement to electrical service if upgrades are required for the proposed PFSF. The small number of in-moving workers would likely live in existing housing during construction and operations that would not require additional utility hookups.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to utilities of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site.	The potential effects on utilities would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Solid and Sanitary Waste. SMALL. The actual quantities of solid wastes expected to be generated are small during both construction and operation of the proposed PFSF and would be shipped to licensed landfills or to permitted low-level waste facilities, as appropriate. Spoils resulting from construction of the proposed PFSF and the proposed rail line would be reapplied for grading purposes, and vegetative wastes along the proposed rail line would be shredded and scattered in place.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to solid wastes of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site.	The potential effects on solid wastes would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Transportation and Traffic. MODERATE TO LARGE. The period of greatest traffic impact would occur during the first 6–8 weeks of constructing the proposed PFSF, with a 172 percent increase in the use of Skull Valley Road for the movement of construction materials and workers resulting in delays along it. Impacts resulting from construction of the proposed rail siding and rail line would be minimal (accounting for only a 4.5 percent increase in traffic along Interstate 80) and would be spatially separate from impacts along Skull Valley Road. Impacts during operation of the proposed PFSF and use of the rail line for the movement of SNF would be substantially less than during construction.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts would be of similar magnitude and significance as those for the proposed action. The contribution to adverse transportation impacts resulting from construction of the ITF would be minimal (accounting for only a 1.2 percent increase in traffic along Interstate 80). In addition to traffic delays during construction of the proposed PFSF (identical to those for the proposed action), there would be some delays along Skull Valley Road during the operation of the proposed PFSF particularly related to movement of fabricated steel liners and 2–4 shipments per week of SNF storage casks to the proposed facility.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area. The impacts to transportation of constructing and operating a facility at the Wyoming site are expected to be less than those at the remote Skull Valley site because of the Wyoming site's closer proximity to the railroad mainline.	The potential effects on transportation would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Economic Structure. SMALL TO MODERATE (but beneficial). Constructing the proposed PFSF and the proposed rail line would directly result in the creation of approximately 255 jobs during the peak of construction and approximately 43 during operation. Construction and operation of the proposed PFSF would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. There should be a large benefit to the Skull Valley Band in the form of lease payments for the duration of the proposed PFSF's operation.	The impacts for this alternative are considered similar to those identified for the proposed action.	Approximately two-thirds as many jobs would be created during the peak of construction as compared to the proposed action. Other impacts to economic structure (e.g., purchases and lease payments to the Skull Valley Band) are equivalent to those for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to economic structure of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site, except for those on the Skull Valley Band. Because this site is not on tribal trust land, the local Native American community would not benefit from lease payment, although members might benefit from employment because of the facility.	The potential effects on economic structure would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored. In addition the Skull Valley Band and likely any other Federally Recognized Indian Tribe would not benefit from lease payments.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Economic benefits of the proposed action include state and county tax payments, local payroll, and other expenditures. Tax payments to the State of Utah are estimated to be $53.5 million, while tax payments to Tooele County are estimated to be $92 million over the life of the project. Local payroll during operation of the proposed PFSF is estimated to be $81 million. Other local expenditures, including operations support and utilities, are estimated to be $70 million. The construction of steel liners for the storage casks could be accomplished locally or in Salt Lake City and could add an additional $747 million to anticipated local expenditures.					

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Land Use					
SMALL TO MODERATE. Impacts to land use for construction of the proposed PFSF would be expected to be quantitatively small (since a small proportion of the total land of the Reservation and an even smaller proportion of land within Skull Valley would be altered), even if the change would be qualitatively different. Construction of the proposed rail line, however, could result in reduced availability of grazing resources, including access to livestock watering resources, during both construction and more particularly during operation.	The impacts for this alternative are considered similar to those identified for the proposed action.	This alternative would avoid adverse impacts to grazing activities that would accompany the proposed action. Construction of the ITF would have minimal land use impacts since the site had been previously disturbed.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area. The impacts to land use of constructing and operating a facility at the Wyoming site are expected to be less than those at the remote Skull Valley site because of fewer land requirements for transporting SNF from the railroad mainline to a storage facility.	The potential effects on land use would depend on the site and the type of expansion required. The impacts at any given nuclear plant would be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Cultural Resources					
SMALL TO MODERATE. Intensive cultural resource source field studies have been conducted at Sites A and B on the Reservation. Based on that information, potential impacts to archaeological and historical resources from construction and operation of the proposed PFSF are considered to be small. Construction of the new rail line from Skunk Ridge would directly impact a small segment of the National Register-eligible historic Hastings Cutoff Trail, and may impact another site (a rock alignment and cairn) that has not been fully evaluated. Construction activities for the rail line are considered to have a moderate impact on cultural resources. Operation of the rail line will have a small impact.	The impacts for this alternative are considered similar to those identified for the proposed action.	Construction of the facility at Site A, a new ITF at Timpie, and use of the Skull Valley Road for heavy haul transport will not directly impact any known archaeological, historical, or traditional resources, although it will alleviate the potential for impact to the Hastings Cutoff Trail segment on the west side of the valley. Use of the Skull Valley Road without alteration will not impact known cultural resources that exist adjacent to the present roadway.	The impacts for this alternative are considered similar to those identified for Alternative 3.	Although equivalent archaeological, historic, and Native American cultural resource studies have not been conducted at the Wyoming Site, it is believed, based on the site file and literature reviews, that impacts to cultural resources would be at least similar to those for a facility in Skull Valley. The fact that a lengthy rail access is not required generally reduces the potential for adverse impacts to cultural resources.	Construction or expansion of at-reactor storage facilities would likely involve areas at the respective site that are already disturbed. Therefore, there would be no anticipated impacts to archaeological or historic resources. Construction on previously undisturbed land already under control of the associated power station could require further cultural resource field studies.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
No traditional cultural properties important to Federally recognized Indian Tribes or culturally important natural resources have been documented at Sites A and B, or along the proposed rail corridor. Consequently, construction and operation of the proposed PFSF is considered to have a small potential for affecting such resources or cultural values.					
Human Health (Excluding SNF Transportation Impacts)					
Non-Radiological Impacts to Workers. SMALL. Occupational accidents during construction and operation of the proposed PFSF and rail line would be expected to result in no fatal injuries and possibly 8 nonfatal injuries during the 40-year life of the proposed PFSF.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts to workers for this alternative would be similar to those from the proposed action. The construction and operation of an ITF instead of a rail line would result in a greater number of potential nonfatal injuries (i.e., 11) over the life of the proposed PFSF.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to workers for this alternative would be similar to those from the proposed action. The primary differences would be related to a shorter length of rail line being constructed in Wyoming.	There would be small, incremental occupational risks to workers during the construction and operation of new or expanded at-reactor storage facilities.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Radiological Doses to Members of the Public. SMALL. The estimated annual dose to a hypothetical individual at the boundary of the proposed PFSF would be no more than 0.056 mSv (5.6 mrem). This is about 2 percent of the dose from natural background radiation in the United States and is well within the 0.25 mSv/yr (25 mrem/yr) limit established by NRC regulations. The dose to the nearest resident would be no more than 3.4×10^{-4} mSv/yr (0.034 mrem/yr).	The impacts to the public for this alternative would be similar to those from the proposed action. While the nearest existing resident is closer to Site B than to Site A, the doses at each site would be small and almost indistinguishable from one another.	The impacts to the public for this alternative would be similar to those from the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to the public for this alternative would be similar to those from the proposed action. However, there is a larger population near the Wyoming site and the nearest residence is closer than in Skull Valley. The dose to the nearest resident would be about 0.02 mSv/yr (2 mrem/yr) which is well within NRC regulatory limits.	Because of the relatively large reactor sites, any incremental off-site doses due to direct radiation exposure from additional on-site SNF storage are expected to be small, and when combined with the contribution from reactor operations, will be well within NRC regulatory limits.
Radiological Doses to Workers. SMALL. The average individual dose to workers engaged in SNF transfer operations at the proposed PFSF is estimated as 0.0445 Sv/yr (4.45 rem/yr) which is within the NRC's regulatory limit of 0.05 Sv/yr (5 rem/yr) for workers.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts to workers for this alternative would be similar to those from the proposed action, except transportation impacts, discussed below.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The impacts to workers for this alternative would be similar to those from the proposed action.	There would be small, incremental doses to workers during the construction and operation of new or expanded at-reactor storage facilities; however, these doses would be expected to be less than the proposed action and a small fraction of the doses from operation of the existing nuclear power station.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Human Health from Transportation of SNF					
Incident-Free Transportation. SMALL. The potential impacts for moving SNF by rail to the proposed PFSF are estimated to be no greater than the equivalent of an LCF of 0.0918 among members of the public along the rail routes for the 20-year campaign to fill the proposed PFSF. The train crew would receive a dose no greater than the equivalent of an LCF of 0.00976.	The impacts for this alternative are considered similar to those identified for the proposed action.	The potential impacts for moving SNF by rail and heavy-haul vehicle (via the ITF) to the proposed PFSF are estimated to be no greater than the equivalent of an LCF of 0.0942 among members of the public along the rail routes for the 20 year campaign. This is slightly higher than the proposed action because of the doses to the public from transporting the casks to the site via Skull Valley Road. The impacts to workers would be higher than the proposed action due to worker exposures at the ITF. Based on PFS's current projections, occupational doses to individual workers involved in activities at the proposed PFSF and the ITF could be as great as 5.3 rem annually, and impacts to these workers would be small to moderate.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The annual impacts of shipping SNF by rail to the Wyoming site are estimated to be no greater than the equivalent of an LCF of 0.0854 for members of the public along the rail routes. The train crew would receive an annual dose no greater than the equivalent of an LCF of 0.0094.	Construction or expansion of at-reactor SNF storage facilities would require no transportation of radioactive materials beyond the boundaries of the existing nuclear station until a permanent geological repository is available.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Non-Radiological Accidents during Transportation. SMALL. The statistical number of vehicle-related accidents associated with the shipment of SNF by rail to Skull Valley is estimated to result in 1.48 injuries and 0.78 fatalities over the 40-year lifetime of the proposed PFSF.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The statistical number of vehicle-related accidents during shipments to the Wyoming site is estimated to result in 1.90 injuries and 1.02 fatalities over the 40-year lifetime of the ISFSI.	Construction or expansion of at-reactor SNF storage facilities would require no transportation of radioactive materials beyond the boundaries of the existing nuclear station until a permanent geological repository is available.
Radiological Accidents during Transportation. SMALL. The potential impacts of accidents during the shipment of SNF by rail to the proposed PFSF are estimated to be no greater than the equivalent of an LCF of 0.0423 among members of the public along the rail routes for the 20-year campaign to fill the proposed PFSF.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The potential impacts of accidents during the shipment of SNF by rail to the Wyoming site are estimated to be no greater than the equivalent of an LCF of 0.0854 among members of the public along the rail routes for the 20-year campaign to fill the facility.	Construction or expansion of at-reactor SNF storage facilities would require no transportation of radioactive materials beyond the boundaries of the existing nuclear station until a permanent geological repository is available.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Environmental Justice					
SMALL. The largest negative effect would be the pre-emption of the 120 ha (295 acres) of land to be cleared for the life of the proposed PFSF and rail corridor, which may have a slight effect on traditional land uses in the BLM lands to the west of Site A. Members of the Skull Valley Band would benefit from the proposed PFSF lease payments and employment. There are no disproportionately high and adverse impacts on low income or minority populations.	The impacts of this alternative are slightly higher than with the proposed PFSF at Site A because of the longer rail corridor required (10 ha additional land). All other effects will be the same as at Site A. There are no disproportionately high and adverse impacts on low income or minority populations	The impacts would be smaller than with the proposed action because this alternative does not include a rail corridor and there are no environmental justice impacts from the ITF. There are no disproportionately high and adverse impacts on low income or minority populations	The impacts would be smaller than the proposed action and similar to those under Alternative 3 because this alternative does not include a rail corridor. There are no disproportionately high and adverse impacts on low income or minority populations	The impacts for a facility in Wyoming would be similar to, but less than those for Alternative 3, because this alternative does not include a lengthy rail corridor or an ITF (the corridor is 2km rather than 51 km). Because this site is not on tribal trust land, the local Native American community would not benefit from lease payments, although members might benefit from employment because of the facility. There are no disproportionately high and adverse impacts on low income or minority populations.	Construction or expansion of at-reactor storage facilities would commit only small amounts of additional land, in most cases already under the control of the associated nuclear power station. Other environmental impacts of construction and operations are negligible for any population. Higher electricity prices resulting from construction or expansion of at-reactor storage facilities would not fall more heavily on minority or low-income populations, but these individuals may be less able to meet any increased costs.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Noise					
SMALL. Noise from large-scale construction would be discernable, although probably not annoying, at outdoor locations near the nearest resident. Construction of a rail line near Interstate 80 would not add appreciably to existing noise levels within passing vehicles. Noise from operation would arise primarily from locomotives transporting casks through Skull Valley to the proposed PFSF. Because the proposed new rail line is on the western side of the valley, and away from the populated eastern side, the noise is not expected to be annoying.	The impacts for this alternative are considered similar to those identified for the proposed action.	Noise impacts of hauling casks along Skull Valley Road would add noticeably to already existing noise levels there. Therefore, noise impacts to persons in the area would be greater than for the rail line option.	The impacts for this alternative are considered similar to those identified for Alternative 3.	There are no discernable differences between noise impacts at the Wyoming sites and the Utah sites. Noise from construction and operation would occur closer to more people at the Wyoming sites, but background noise is already higher there due the greater amount of human activity.	Some local noise impacts might occur near existing nuclear stations if at-reactor facilities need to be expanded; however, these impacts are expected to be small.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	**Alternative 2 (Site B, rail)**	**Alternative 3 (Site A, ITF)**	**Alternative 4 (Site B, ITF)**	**Wyoming alternative[a]**	**No action**
Scenic Qualities					
MODERATE. Construction and operation would have the direct impact of changing the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. This change would represent small to moderate impacts to recreational viewers, residents of Skull Valley, and motorists traveling Skull Valley Road and Interstate 80.	Impacts for the proposed PFSF located at Site B would be similar to those at Site A. However, visual impacts could be slightly larger because of the additional 10 ha (24 acres) of land needed for the rail corridor to Site B.	Impacts would be smaller than under Alternatives 1 and 2 because no new rail line would be needed. However, impacts would still be moderate to some viewers.	The impacts for this alternative are considered similar to those identified for Alternative 3.	Visual impacts would be similar to Alternatives 1 to 4 for the ISFSI. Visual impacts of transportation would be less than for Alternatives 1 to 4.	Would result in smaller visual impacts than the other alternatives. Relatively minor visual impacts would be expected to occur at existing nuclear power plants.

Potential impacts of alternatives					
Alternative 1 (proposed action, Site A, rail)	Alternative 2 (Site B, rail)	Alternative 3 (Site A, ITF)	Alternative 4 (Site B, ITF)	Wyoming alternative[a]	No action
Recreation					
SMALL. There may be some delays or inconvenience to users wishing access to recreational resources and opportunities, particularly during construction, when access to these resources in Skull Valley would be adversely affected by the movement of construction materials and workers on Skull Valley Road. Access to resources west of the proposed rail line would be affected by rail line construction. Impacts to recreational resources and opportunities should be smaller during operations.	The impacts for this alternative are considered similar to those identified for the proposed action.	The impacts of constructing and operating the proposed PFSF at Site A are identical to those for the proposed action. The impacts due to construction and use of the ITF and shipment of SNF by heavy-haul tractor trailer along Skull Valley Road are expected to be almost non-existent during construction (since the site of the ITF is close to Interstate 80 and is not expected to affect recreational resources) and should result in delays during operations for users traveling along Skull Valley Road to access recreational resources in Skull Valley. This impact to Skull Valley Road during operations would be avoided for the proposed action.	The impacts for this alternative are considered similar to those identified for Alternative 3.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to recreation of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site.	The potential effects on recreation would depend on the site and the type of expansion required. The impacts at any given nuclear plant would likely be substantially smaller than those expected for the Skull Valley site due to the much smaller quantity of SNF that would need to be stored.

[a]The Wyoming site has been compared to the proposed site (i.e., Site A in Skull Valley) only to determine if it is obviously superior to the Skull Valley site selected by PFS.

1. PURPOSE AND NEED

1.1 Introduction

Private Fuel Storage L.L.C. (PFS), a limited liability company owned by eight U.S. power utilities, proposes to construct and operate a privately-owned independent spent fuel storage installation (ISFSI) on the Reservation of the Skull Valley Band of Goshute Indians (Reservation) (see Figure 1.1). The Reservation is bordered on all sides by Tooele County, Utah. To transport spent nuclear fuel (SNF) to the ISFSI, PFS proposes to construct and operate a rail siding and rail line on land managed by the U.S. Department of Interior's Bureau of Land Management (BLM). The project, as proposed, requires approval from four Federal agencies: the U.S. Nuclear Regulatory Commission (NRC), the U.S. Department of Interior's Bureau of Indian Affairs (BIA) and BLM, and the U.S. Surface Transportation Board (STB). The NRC, BIA, BLM, and STB have cooperated in the preparation of this draft environmental impact statement (DEIS).

This DEIS evaluates the potential environmental effects of the ISFSI proposed by PFS, including the construction and operation of new transportation facilities that would provide access to the proposed ISFSI, and a consideration of alternatives to that proposal. This DEIS has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), NRC regulations for implementing NEPA (10 CFR Part 51), and the guidance provided by the Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA (40 CFR Part 1500).

1.2 The Proposed Action

The proposed action would include construction and operation of the proposed ISFSI [also called the Private Fuel Storage Facility (PFSF)], including transporting SNF to the proposed PFSF, and the construction of a rail line from Skunk Ridge to the proposed PFSF site (see Figure 1.2 for project locations).

The proposed PFSF would be constructed and operated on the Reservation approximately 44 km (27 miles) west-southwest of Tooele, Utah (see Figure 1.1). PFS proposes to build the ISFSI on a 330-ha (820-acre) site leased from the Skull Valley Band of Goshute Indians (Skull Valley Band). The site (designated Site A) would be located in the northwest corner of the Reservation approximately 6 km (3.5 miles) from the Skull Valley Band's village.

The proposed PFSF would be designed to store up to 40,000 metric tons of uranium (MTU) of SNF. The capacity of the proposed PFSF would be sufficient to store all the SNF from the PFS member utilities, as well as SNF from utilities that are not members of PFS. The eight members of PFS are Indiana-Michigan Power Company (American Electric Power), Consolidated Edison Company of New York, GPU Nuclear Corporation, Northern States Power Company, Illinois Power Company, Southern Nuclear Operating Company, Southern California Edison Company, and Genoa FuelTech, Inc. The locations of their reactors are shown in Figure 1.3.

PFS proposes to use a dual-purpose canister-based system for storage and transportation of the SNF. At the reactor sites of commercial nuclear power plants, the SNF to be shipped to the

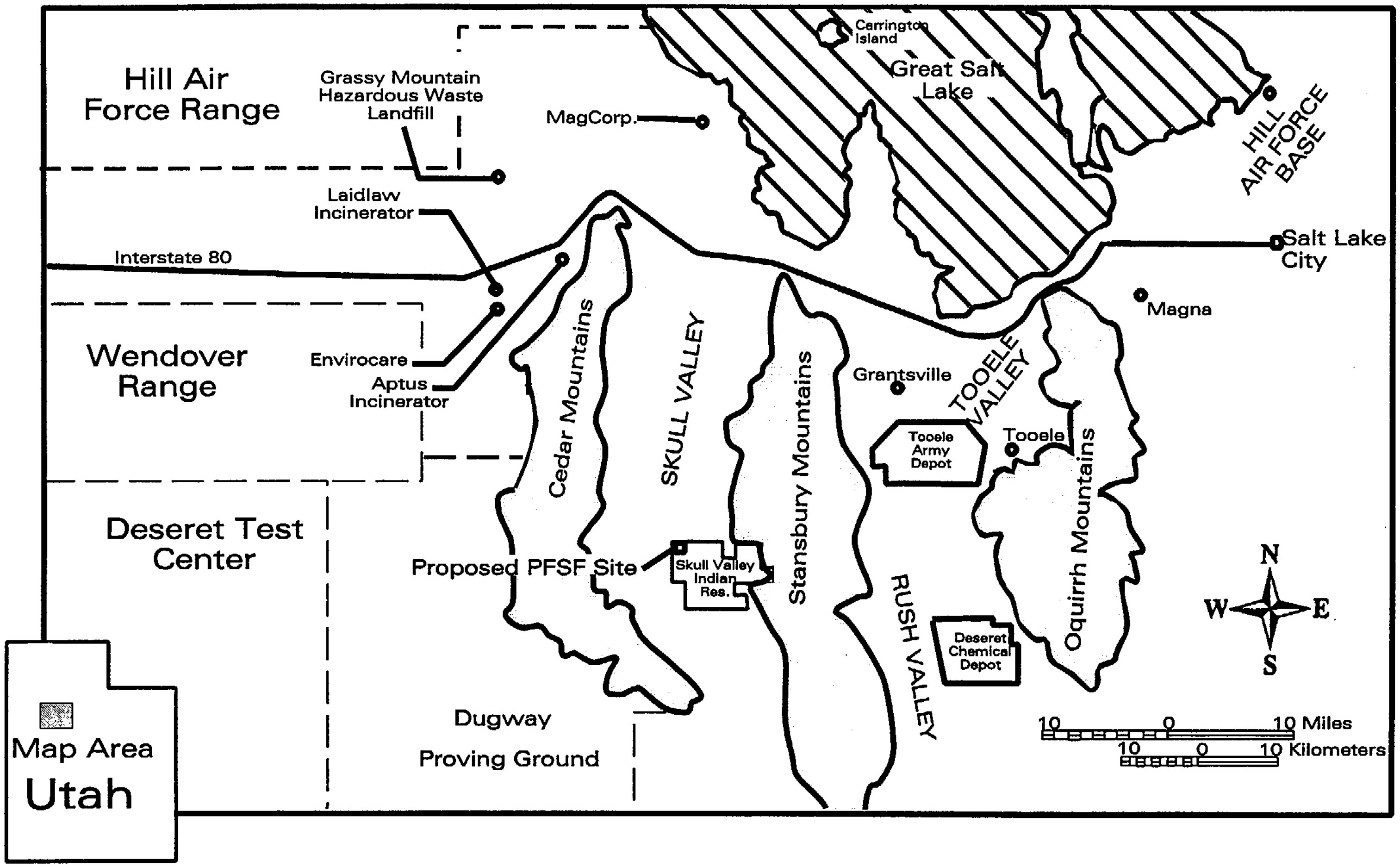

Figure 1.1. Regional location of Skull Valley in Utah.

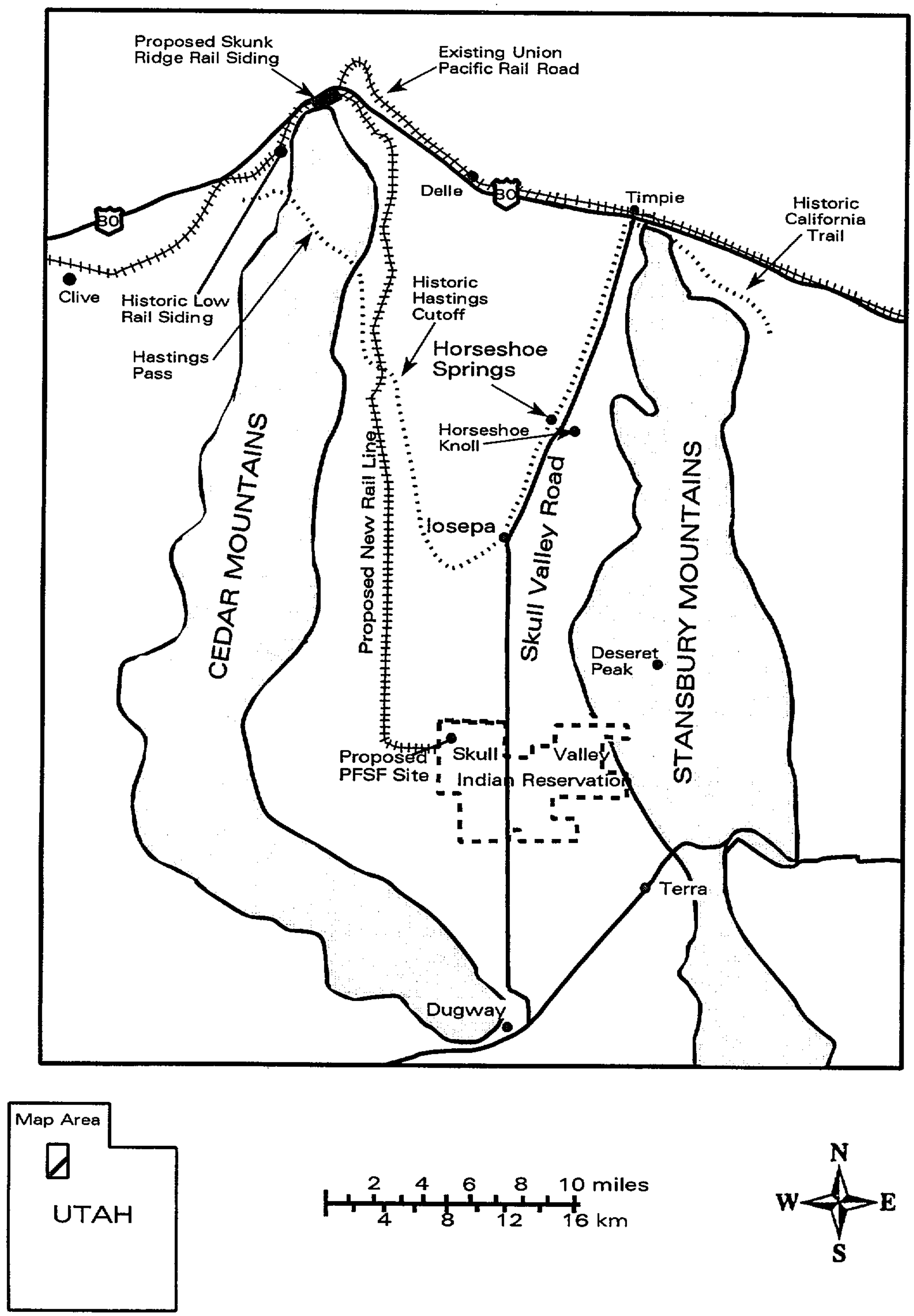

Figure 1.2. The proposed project area in Skull Valley, Utah.

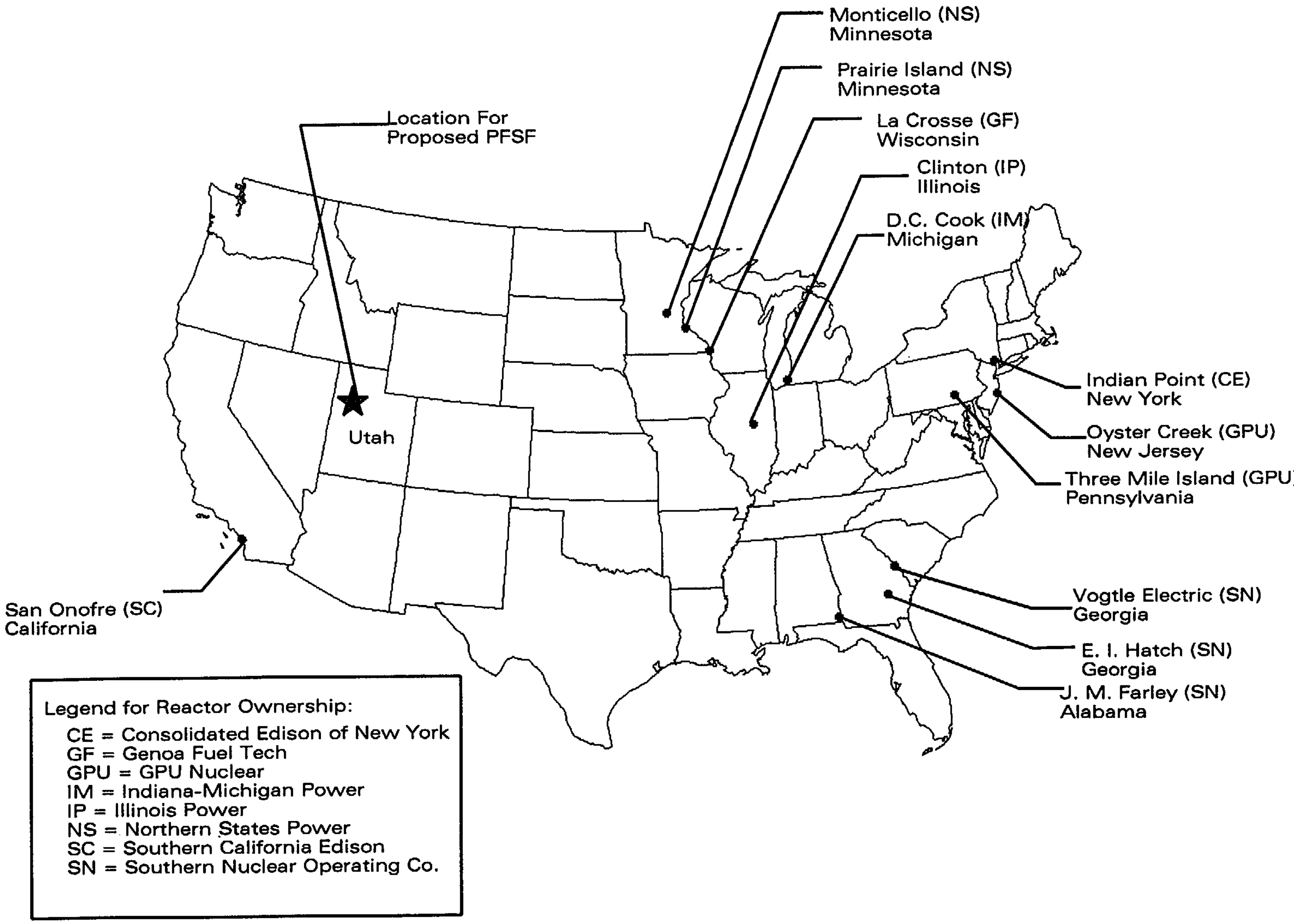

Figure 1.3. Reactors which are owned by the PFS companies.

BACKGROUND INFORMATION ON SPENT NUCLEAR FUEL

More than 100 commercial nuclear power plants have been built in the U.S. and about 20 percent of the nation's electricity comes from nuclear power. Like other industrial plants, nuclear power stations produce byproducts from their operating processes. The primary by-product from a nuclear reactor is used or "spent" nuclear fuel (SNF).

Nuclear fuel consists of enriched uranium in small, ceramic-like pellets, slightly larger than pencil erasers. These small pellets produce a tremendous amount of energy when used in a nuclear power plant. For example, a single pellet contains the energy equivalent of almost one ton of coal. The pellets are stacked end-to-end and sealed inside metal tubes 3.5 to 4.5 m (12 to 15 ft) long. The tubes containing the uranium pellets are bundled together in groups of about 200 to form nuclear fuel assemblies (DOE 1999). These fuel assemblies are placed inside a nuclear reactor and function as the core where the nuclear fission process occurs. Fission is a controlled chain reaction, in which atoms split, thereby releasing energy and producing heat. The heat is then used to generate steam and to produce electricity until the fuel becomes "spent," or no longer efficient in generating the amounts of heat needed.

Periodically about one-third of a nuclear reactor's fuel is removed and replaced with new, more efficient fuel (this is called an operating cycle and typically lasts 18–24 months). Thus a reactor may operate for 2–3 operating cycles after it loses full-core offload capability. Full core offload capability refers to a power plant's capability to remove all fuel from the reactor vessel and store it in the spent fuel pool. Radioactive materials remain inside the sealed tubes within the fuel assemblies until termination of the license.

During the term of the operating license, these SNF assemblies are typically stored either under water in pools or in dry storage facilities at the operating reactor site. The water in these pools is circulated to maintain cooling and is monitored for radioactivity and for evidence of tube corrosion. Over time, the fuel assemblies lose heat and also become less radioactive.

proposed PFSF would be placed in sealed metal canisters. These canisters would then be placed inside NRC-approved steel shipping casks for transport by rail to a new rail siding north of the proposed PFSF. The proposed action would allow for local transportation to the proposed PFSF site from the new rail siding via a proposed new rail line (see Figure 1.2). The number of loaded spent fuel canisters (inside shipping casks) to be received at the proposed PFSF is estimated to be between 100 and 200 annually. Each canister would contain approximately 10 MTU of SNF.

At the proposed PFSF site, dry cask storage technology would be used—storing SNF inside sealed metal canisters that would be loaded into steel/concrete storage casks that are then placed on concrete pads. Canister-based systems confine radioactive wastes and would be licensed by the NRC in accordance with 10 CFR Part 72 (NRC requirements for storage of SNF). As many as 4,000 canisters in individual storage casks would be needed to store a maximum of 40,000 MTU of SNF. Phase 1 construction, which would provide an operational facility, is planned to begin upon issuance of the NRC license and effectiveness of the BIA lease and would be completed within 2 years. Ownership and ultimate responsibility for the SNF would continue to remain with the originating utilities, until such time as the SNF is transferred to the U.S. Department of Energy (DOE) for long-term storage or disposal. A more detailed description of the proposed project facilities and the proposed storage system is provided in Section 2.1 of this DEIS.

The proposed PFSF would be licensed by NRC to operate for up to 20 years and the license could be renewed. At the end of the licensed life of the proposed PFSF and prior to the expiration of the lease, it is expected that SNF would be shipped to a permanent repository. This is consistent with the NRC's Waste Confidence Decision (55 Fed. Reg. 38474; Sept. 18, 1990), which states that at least one mined geological repository will be available by the end of 2025. On December 6, 1999, the NRC issued a Federal Register Notice (64 Fed. Reg. 68005) which presented a status report on the review of the Waste Confidence Decision. The status report stated that "[t]he Commission is of the view that experience and developments since 1990 confirm the Commission's 1990 Waste Confidence findings."

1.3 Need for the Proposed Action

The proposed action is intended to satisfy the need for an interim facility that would provide a safe, efficient, and economical alternative to continued SNF storage at reactor sites. Such an interim facility would satisfy a need for additional storage capacity of the PFS members utilities, as well as non-member utilities, who face storage limitations, and ensure that (1) operation of a nuclear power plant would not cease before operating license expiration because of a lack of SNF storage capacity; (2) permanently shut-down reactors could be decommissioned sooner, resulting in a savings to the utilities and earlier use of the land for other activities; and (3) for some utilities, an economical alternative to at-reactor storage would be available. In addition, the proposed action would serve the Skull Valley Band's economic development, consistent with the BIA's trust responsibility.

Storage of SNF at commercial nuclear reactor sites is an increasingly important concern to the utilities operating these facilities. As set forth below, many reactor owners are faced with the possibility that their facilities will be unable to store SNF and be forced to halt power generation operations before their operating licenses expire.

The on-site SNF storage capacities (i.e., of spent fuel pools) of many U.S. nuclear power plants were designed to accommodate only a few reactor core discharges. The rationale was that SNF would be periodically removed from the spent fuel pool and shipped offsite for reprocessing[1] before the pool became full. However, SNF reprocessing never materialized as an option because of the relative abundance of natural uranium and the U.S.'s concern that the use of plutonium from reprocessed civilian SNF could be used for nuclear weapons production (i.e., the non-proliferation issue) (Holt 1998). Because the U.S. has abandoned the concept of reprocessing SNF, the "once through" nuclear fuel cycle has become the *defacto* policy.

In 1977, DOE announced that the Federal Government would accept and take title to the SNF from U.S. utilities. This policy was designed to meet the needs of nuclear reactors for both interim and permanent disposition of SNF (NRC 1979). DOE was mandated by the Nuclear Waste Policy Act of 1982 (NWPA) to begin disposing of commercial SNF at a permanent underground repository by January 31, 1998. To fund the program, utilities were required to pay a fee, proportional to the amount of power (in kilowatt-hours) they generated, into the nuclear waste fund (Holt 1998).

[1]Reprocessing is a chemical operation in which residual uranium and plutonium in SNF are separated from radioactive wastes (fission products) produced during reactor operation. The residual uranium and plutonium are then purified and reused.

Both the original NWPA and the Nuclear Waste Policy Act of 1987 (NWPAA) recognized that some form of centralized interim storage would be a component of the national program. The original act called for this interim storage facility to be located in any state other than the state in which the permanent geological repository would be located. The NWPAA created the position of Nuclear Waste Negotiator (NWN), who was assigned the task of finding a host site for a monitored retrievable storage facility (MRS). Several Federally Recognized Indian Tribes, including, for example, the Skull Valley Band and other units of government expressed interest in hosting the MRS. However, the NWN and the MRS program expired in 1994 without an MRS host being identified.

A permanent geological repository is now projected to be completed by DOE and could begin receiving commercial reactor SNF by 2010 (DOE 1999). Before a permanent repository becomes available, however, several nuclear utilities anticipate that their on-site SNF storage capacity may become inadequate. As a result, these utilities see an interim facility as a viable solution to their SNF storage concerns.

To date, utilities have been coping with the SNF storage problem by employing, primarily, two methods to increase on-site SNF storage capacity: (1) expanding the capacity of spent fuel pools to store SNF and (2) constructing ISFSIs at the reactor site (also called "at-reactor" ISFSIs). Spent fuel pool storage capacity may be expanded by replacing the original or existing fuel storage racks with new racks designed for closer spacing of fuel assemblies or adding new racks, thus allowing more fuel assemblies to be stored in the pool. Although many U.S. nuclear power plants, including most of the plants owned by the PFS member utilities, have already expanded the capacity of their spent fuel pools to store SNF, several are still running out of storage space. In fact, many reactor fuel pools are already at capacity, and it is projected that 80 percent of U.S. reactors will lose full core offload capability by 2010 (see Figure 1.4). Full core offload capability refers to a power plant's capability to remove all fuel from the reactor vessel and store it in the spent fuel pool. Table 1.1 lists the remaining storage capacity for each plant owned by PFS members and the projected date when full core offload capability would be lost.

Regulations have been established by NRC in 10 CFR Part 72 that allow for both at-reactor ISFSIs and off-site ISFSIs (also called "away-from-reactor" ISFSIs). Pursuant to Subtitle B of the NWPA, all nuclear power plants licensed under 10 CFR Part 50 have a general license for at-reactor dry cask storage at an on-site ISFSI. A utility exercising its general license may select a storage cask system approved by NRC and listed in 10 CFR Part 72, Subpart K. A utility must maintain its Part 50 license in order to maintain its general license for dry cask storage.

Utilities may also apply for a site-specific ISFSI license. An application for a site-specific license must specify the storage cask(s) that the utility plans to use. A site-specific license can be for at-reactor or away-from reactor storage. Utilities storing spent fuel under site-specific licenses need not maintain Part 50 licenses to do so.

As of January 2000, there were 15 ISFSIs operating in the U.S. (see Figure 1.5), and approximately 15 to 20 additional ISFSIs are proposed for the near term. Of the 15 ISFSIs, one (Prairie Island) is owned by a PFS member. All operating ISFSIs in Figure 1.5 are located at licensed reactor sites except GE-Morris and the DOE facilities at Fort St. Vrain and Idaho National Engineering and Environmental Laboratory.

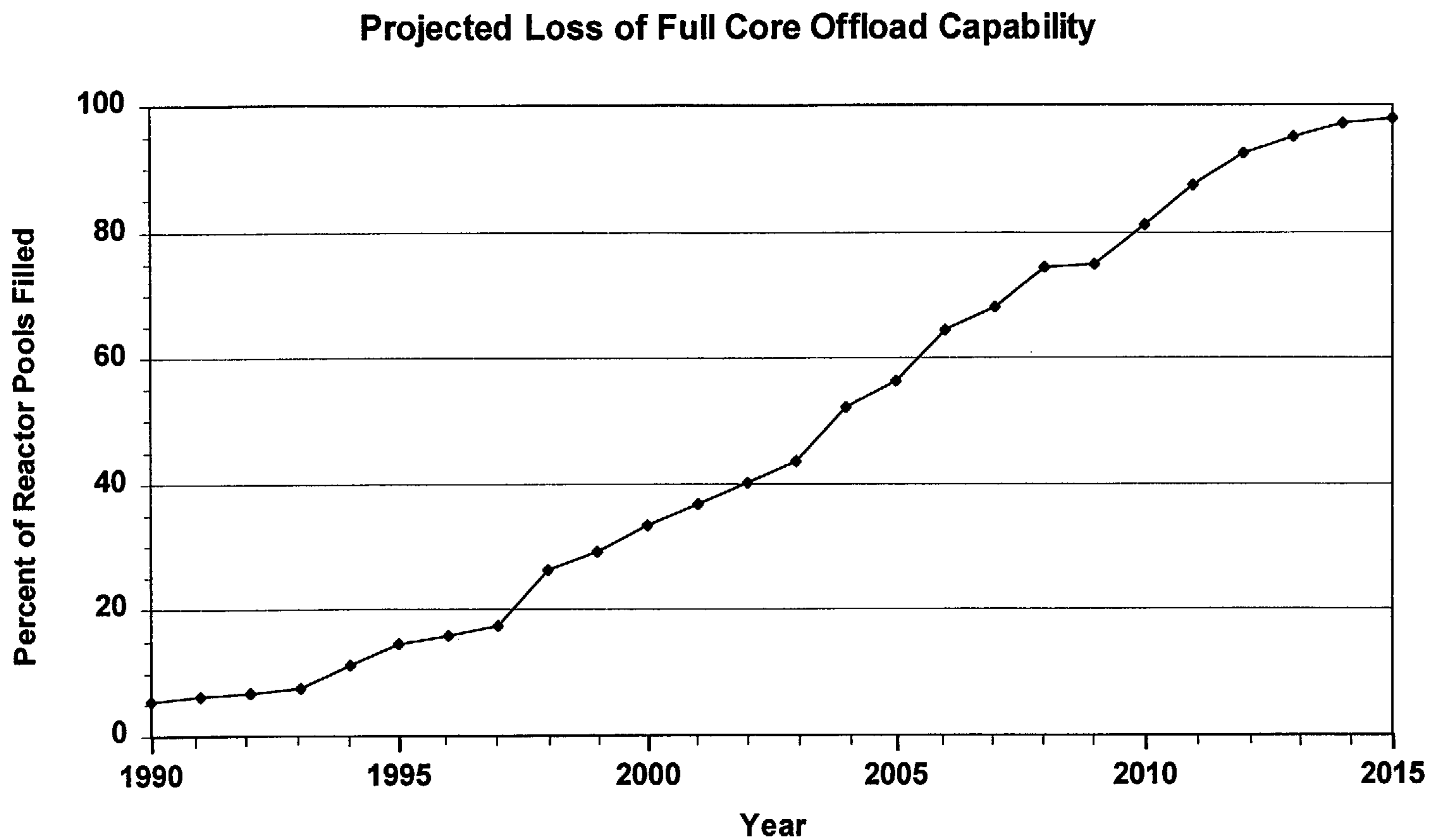

Figure 1.4. Projected loss of full core offload capability for U.S. commercial nuclear reactors. *Sources*: Energy Resources International and DOE/RW-0431, Rev. 1.

Table 1.1. Site-specific reactor information for PFS member utilities

Utility	Reactor[a]	Remaining storage capacity (no. spaces)	Projected date of loss of full-core offload capability
Consolidated Edison Company of New York	Indian Point Unit 1	Shutdown; fuel onsite	N/A (shutdown)
	Indian Point Unit 2	457	2005
Southern California Edison Co.	San Onofre Unit 1	Shutdown; fuel onsite[b]	N/A (shutdown)
	San Onofre Unit 2	672	2006
	San Onofre Unit 3	624	2006
Genoa FuelTech, Inc.	La Crosse Boiling Water Reactor	Shutdown; fuel onsite	N/A (shutdown)
Indiana-Michigan Company (American Electric Power)	D.C. Cook Units 1 and 2	1598 (shared)	2010 (both units)
Illinois Power Company	Clinton	1381	2005
GPU Nuclear Corporation	Oyster Creek	180	1996[c]
	Three-Mile Island	583	2009
Northern States Power Company	Monticello	1115	2006
	Prairie Island Units 1 and 2	125 (shared)	2007 (both units)
Southern Nuclear Operating Co.	Farley Unit 1	527	2006
	Farley Unit 2	641	2010
	Hatch Units 1 and 2	1062 (shared)	2000 (both units)
	Vogtle Units 1 and 2	2392 (shared)	2015 (both units)

[a]See Figure 1.3 for reactor locations.
[b]Pool is full; additional Unit 1 assemblies are being stored on an interim basis in Units 2 and 3 pools and in space leased at the General Electric Morris Facility through 2002.
[c]Full-core offload capability was lost in 1996.

Source: Private Fuel Storage, L.L.C.; Storage capacity data are current as of November 1998; full-core offload capability estimates were developed in May 1998.

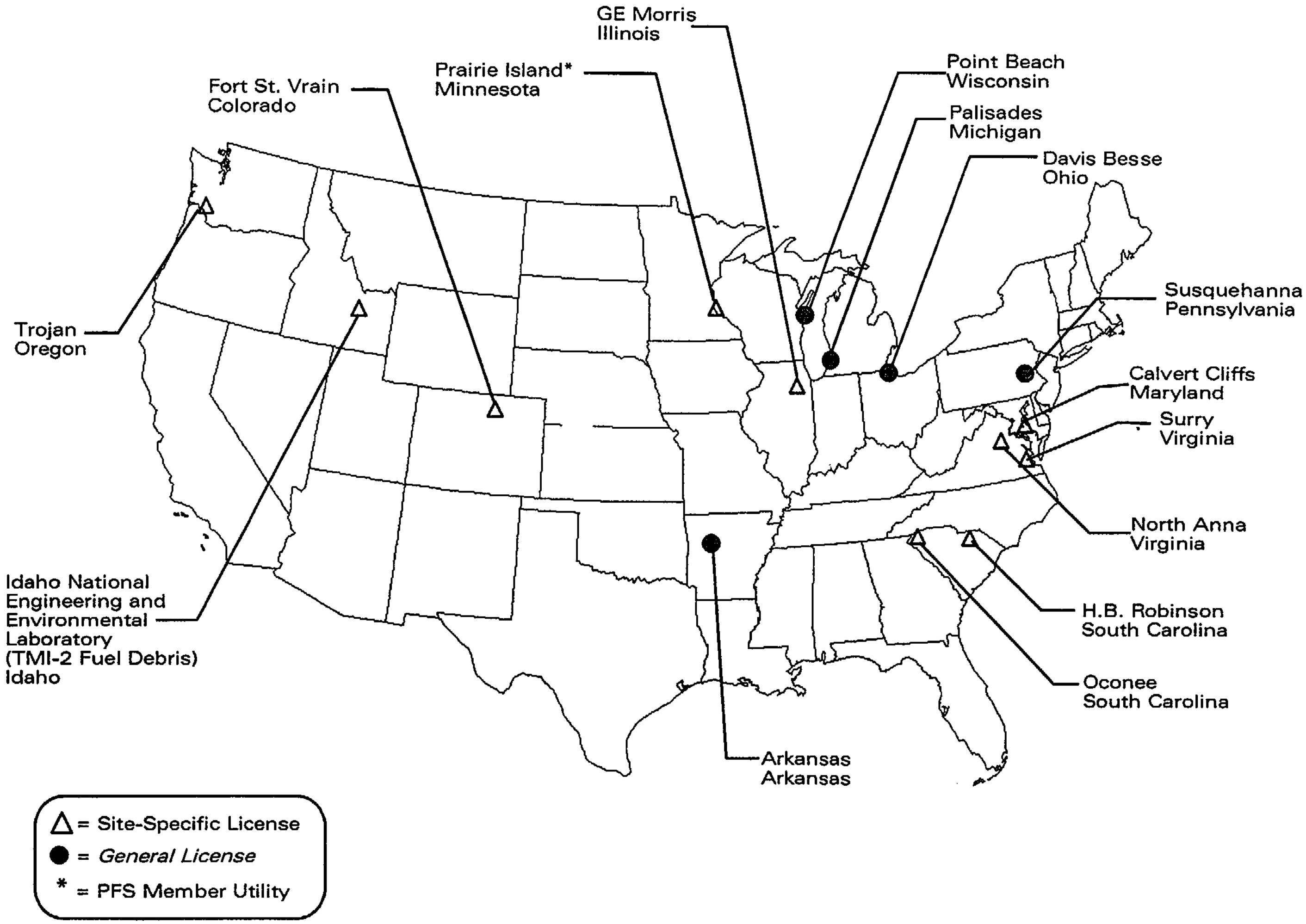

Figure 1.5. Operating spent fuel storage sites (i.e., ISFSIs) as of April 2000.

While many utilities are building at-reactor ISFSIs, PFS has identified three primary reasons why an away-from-reactor ISFSI is needed. First, PFS indicated that some reactor sites have physical limitations that would prevent building or expanding an at-reactor ISFSI. For these reactors, an away-from-reactor ISFSI would provide an SNF storage option. Absent such an option, these reactors would have to shut down once they reach their SNF storage capacities, which could occur prior to the end of their current operating licenses. Second, an away-from-reactor ISFSI would afford utilities with reactors that are already shut down the ability to fully decommission their sites sooner. An away-from-reactor ISFSI would provide an off-site facility for the storage of SNF, thereby reducing the amount of time a utility would need to maintain a shut down reactor site. Until all SNF has been removed, the site cannot be fully decommissioned, and a utility would continue to incur the cost of maintaining the reactor site. Third, PFS has indicated that a centralized away-from-reactor interim storage facility would reduce the cost of SNF storage.

1.4 Scoping Process

The scoping process was initiated on May 1, 1998, with the publication of a Notice of Intent (NOI) to prepare an EIS and conduct the scoping process (63 Fed. Reg. 24197). As described in the NOI, the objectives of the scoping process were to

- define the scope of the proposed action that is to be the subject of the EIS;
- determine the scope of the EIS and identify significant issues to be analyzed in depth;
- identify and eliminate from detailed study issues that are peripheral or are not significant;
- identify any environmental assessments and other EISs that are being or will be prepared that are related to but not part of the scope of the EIS under consideration;
- identify other environmental review and consultation requirements related to the proposed action;
- indicate the relationship between the timing of the environmental analyses and the Commission's tentative planning and decision-making schedule;
- identify any cooperating agencies and, as appropriate, allocate assignments for preparation and schedules for completion of the EIS to the NRC and any cooperating agencies; and
- describe the means by which the EIS will be prepared, including any contractor assistance to be used.

A scoping meeting was held in Salt Lake City, Utah, on June 2, 1998. Thirty-five people offered comments at the meeting, including the Governor of Utah (via videotape), a member of the U.S. Congress, representatives from Federal and State of Utah agencies, and Federally Recognized Indian Tribes. During the scoping meeting, PFS presented a briefing on the proposed action and the NRC staff summarized the environmental review process and the proposed scope of the EIS. Comments and suggestions from the audience were received and are summarized in the scoping report (NRC 1998) (see Appendix A). During the remainder of the public comment period, NRC received 30 comment letters, which are also summarized in the scoping report.

Two additional scoping meetings were held on April 29, 1999, to address the PFS proposal to construct a new rail line down the western side of Skull Valley and the required plan amendment to the Pony Express Resource Management Plan (RMP), and to address any environmental concerns associated with the lease agreement that might not have been discussed at the previous scoping meeting. The notice for these meetings was published in the Federal Register on April 14, 1999, (64 Fed. Reg. 18451). One meeting was held in Salt Lake City and the other in Tooele, Utah. After presentations were made by BIA, BLM, and the NRC, oral comments were provided by representatives of a member of the U.S. Congress, Utah State departments or agencies, a Federally Recognized Indian Tribe, private organizations, and interested members of the public. Written comments were also received (see Appendix A).

The comments provided by the State of Utah and other interested members of the public, which represent the major points of view on the proposed action, identified a number of environmental concerns. These concerns were summarized in the original scoping report and the supplemental scoping report and were considered in determining the scope of this DEIS (see Appendix A).

On the basis of the scoping process and the requirements of NEPA and 10 CFR Part 51, the cooperating agencies determined that this DEIS would address the potential environmental impacts of constructing and operating the proposed PFSF and related transportation facilities for the following issues:

- ***Radiological impacts and human health and safety.*** The potential public health consequences of the proposed action are evaluated with emphasis on radiological exposure risk during normal operations, including transport of the SNF (including handling, transfer, and inspection activities) and under credible accident scenarios. Nonradiological events and activities with potential human health impacts are also identified and evaluated.
- ***Cumulative impacts.*** The DEIS analyzes the potential cumulative impacts, if any, of the proposed PFSF in the context of other existing and proposed facilities and activities in the area of the proposed project area, which includes the site, the rail line, and the intermodal transfer facility (ITF), as appropriate.
- ***Socioeconomics.*** The socioeconomic issues that fall within the scope of the DEIS include the direct and indirect economic effects (both beneficial and adverse) on employment, taxes, residential and commercial development, agriculture, and public services in the area. The effects of the proposed action on land use in the area, including use of public lands, tribal trust lands, and rights-of-way, are assessed in the DEIS. The DEIS also includes an evaluation of the extent to which lands and land use may be disturbed or altered during construction and operation of all portions of the proposed action. In addition, recreational and tourism sites, wilderness areas, and aesthetic values of the area are analyzed.
- ***Cultural resources and environmental justice.*** The DEIS assesses potential impacts of the proposed action on the historic and archaeological resources of the area and on the cultural traditions and lifestyle of Native Americans. An environmental justice review is included in the DEIS. The DEIS also discusses the status of the consultation on historic properties required by the National Historic Preservation Act of 1966, as amended.
- ***Geology and seismicity.*** The DEIS describes the geologic and seismic characteristics of the proposed site and evaluates the impacts of construction and operation of the proposed action on the site's geology and soils. Evaluation of the potential for earthquakes, ground motion, soil stability concerns, surface rupturing, and any other major geologic or seismic considerations that would affect the suitability of the proposed site as a storage location for SNF are addressed in the NRC's Safety Evaluation Report (SER) (see Section 1.5.1) rather than the DEIS; the SER also addresses cask design, particularly in the context of potential seismic events. The SER is currently being developed by the NRC staff, and a summary of the NRC's evaluation findings will be provided in the Final EIS.

- ***Transportation.*** The analysis of potential impacts resulting from the transportation of SNF considers relevant aspects of both rail and truck transport to the proposed PFSF. The DEIS discusses the number, type, and frequency of shipments, as well as routing considerations and the quantities of SNF being shipped. The impacts of transportation are evaluated primarily in terms of radiological exposure risk during normal transportation (including handling, transfer, and inspection) and under credible accident scenarios. The non-radiological impacts of transportation are also identified and evaluated. Construction and maintenance activities required for rail or road systems are assessed, including input from BIA and BLM.
- ***Accidents.*** NRC safety regulations and guidance specify that the facility be designed to withstand various credible accidents, including natural events, without having a significant radiological release. The SER includes an evaluation and determination on (1) the adequacy of the design to withstand credible accidents, (2) the potential for a radiological release to occur as a result of any such accident, and (3) the significance of any such radiological release. The DEIS analyzes the potential environmental impacts resulting from credible accidents at the proposed facility.
- ***Compliance with applicable regulations.*** The DEIS presents a partial listing of the relevant permits and regulations that are believed to apply to the proposed facility. Regulatory or legal issues covered in the DEIS include water rights, land use restrictions such as rights-of-way, and oil, gas, or mineral leases that would interfere with the availability or suitability of the proposed site.
- ***Air quality.*** Potential air quality impacts of the proposed project are evaluated in the DEIS. The evaluation includes potential impacts resulting from construction activities and operation and compares the anticipated air quality impacts, if any, with relevant standards. Appropriate modeling is performed to assist in the analysis of potential air quality impacts.
- ***Hydrology.*** The DEIS assesses the potential impacts of the proposed project on surface water and groundwater resources. The assessment considers water resources, water quality, water use, floodplains, and the probable maximum flood (PMF), which is evaluated in the NRC SER.
- ***Ecological resources.*** The DEIS assesses the potential environmental impacts of the proposed action on ecological resources, including plant and animal species and threatened or endangered species or critical habitat that may occur in the area. As appropriate, the assessment includes potential effects on wildlife migration patterns, and mitigation measures to address adverse impacts are analyzed. The DEIS also discusses the status of any consultation required by the Endangered Species Act of 1973, as amended.
- ***Need for the facility.*** A discussion of the need for the proposed facility and the expected benefits is presented in the DEIS and includes an estimate of the amounts of SNF generated by participating nuclear power plants and the utilities' capabilities to store that fuel.
- ***Decommissioning.*** The DEIS includes a general discussion of the impacts associated with decommissioning of the proposed PFSF and related transportation facilities.
- ***Alternatives.*** The no-action alternative and other reasonable alternatives to the proposed action, such as alternative sites or alternative storage methods, are described and assessed in the DEIS.

In addition to the above items, issues identified by BLM for the proposed rail access corridor include fire, range land health, livestock management, noxious weeds, wildlife, wild horses, wetlands, historic trails, and access.

1.5 Cooperating Agencies

For the proposed PFSF in Skull Valley to operate, the NRC, BIA, BLM, and STB must all approve certain aspects of the proposed action. Because each agency must take an action and because those actions are interrelated, the NRC, BIA, BLM, and STB have agreed to cooperate in the preparation of a single DEIS.

The NRC is the lead agency in the preparation of this DEIS. The preparation of a single EIS results in more efficient use of Federal resources. Each agency's action is described in the following paragraphs.

1.5.1 NRC Federal Action

On June 20, 1997, PFS applied to the NRC for a license to receive, transfer, and possess SNF and operate an ISFSI in the northwest corner of the Reservation. The initial period of the license would be for 20 years, with the option of renewal. The NRC's decision-making process includes an environmental review (i.e., this DEIS) and safety review (see the discussion in the dialogue box) of the construction and operation of the proposed PFSF at the proposed site. Upon completion of both reviews, the NRC will decide whether to grant, with or without conditions, or deny the PFS request. Pursuant to 10 CFR 51.102(c), when a hearing is held on a proposed action, the initial decision of the presiding officer or the final decision of the Commissioners acting as a collegial body will constitute the record of decision.

The NRC safety regulations for an ISFSI are delineated in 10 CFR Part 72. Compliance with these regulations will provide reasonable assurance that the design and operation of an ISFSI will provide adequate protection of the public health and safety. NRC's regulations for NEPA compliance are set forth in 10 CFR Part 51. Consistent with NEPA, NRC regulations require that an EIS be completed for major Federal actions significantly affecting the quality of the human environment, such as licensing an away-from-reactor ISFSI.

BACKGROUND INFORMATION ON NRC's SAFETY REVIEW PROCESS

The NRC safety review of an ISFSI includes the preparation of a detailed report called a Safety Evaluation Report (SER). The SER is based, in part, upon the Safety Analysis Report submitted by the applicant. The SER also includes the NRC's review of technical issues such as the adequacy of the facility design to withstand external events (i.e., earthquakes, floods, and tornadoes); radiological safety of facility operation, including doses from normal operations and accidents; emergency response plans; physical security of the facility; fire protection; maintenance and operating procedures; and decommissioning (note: the SER is made available to the public).

In addition to an SER for the ISFSI, NRC regulations require that an ISFSI use only storage and transportation cask designs that are certified pursuant to 10 CFR Parts 72 and 71, respectively. For a cask design to be certified, the NRC must first complete a detailed review against the requirements of either 10 CFR Part 72 (for storage casks) or 10 CFR Part 71 (for transportation casks), or both for a dual-purpose shipping/storage cask. An SER would be completed for each cask and would describe the NRC's review of the adequacy of the cask design for technical issues such as the cask's ability to withstand external events (such as fires) and radiological impacts from normal use and accidents.

1.5.2 BIA Federal Action

A conditional lease between PFS and the Skull Valley Band was executed on May 23, 1997. PFS and the Skull Valley Band propose to enter into a lease for the site for 25 years, with an irrevocable option for an additional 25 years. The proposed lease would allow for the use of approximately 330 ha (820 acres) of land in the northwest corner of the Reservation for the proposed PFSF and 82 ha (202 acres) of land for a utility and road access corridor, which includes rights-of-way for water pipelines, across tribal trust land, as well as for a buffer zone around the proposed PFSF. Only land uses currently existing on the buffer zone would be permitted unless consent is given by both parties. The Skull Valley Band cannot, under 25 USC Sections 177 and 415, convey an interest in Reservation land held in trust without approval of the United States. Therefore, BIA must review and either approve or disapprove the lease.

A determination to approve or disapprove the lease is made on a two-tiered decision process. The first tier is to determine whether the lease meets regulatory requirements for lease of tribal trust lands set forth in 25 CFR Part 162. The second tier of the decision process is documentation of NEPA compliance. After completing its regulatory review, including this DEIS, BIA will issue a Record of Decision (ROD). The lease is not final until the Final EIS is completed, commitments to mitigation measures identified in the BIA ROD are made, and the NRC issues a license to PFS.

Because of BIA's unique role in approving or disapproving the proposed lease, the purpose and need for its action differ from those of the NRC. The purpose of BIA's action is to promote the economic development objectives of the Skull Valley Band. The need for BIA's action is its government-to-government relationship with, and trust responsibility (including consideration of environmental impacts) to the Skull Valley Band. This difference has ramifications for the scope of BIA's NEPA review and the range of the BIA's reasonable alternatives. As part of its government-to-government relationship with the Skull Valley Band, BIA's NEPA review is limited to the scope of the proposed lease negotiated between the parties, not evaluation of actions outside the lease (e.g., ultimate disposition of the SNF). Similarly, the range of BIA's reasonable alternatives is limited to those that will serve the Skull Valley Band's economic development, consistent with the BIA's trust responsibility [i.e., the approval of the proposed PFSF site location(s) on the Reservation, and no action—disapproval of the lease]. PFS has identified an alternative site location on the Reservation (see Section 2.2.3). If BIA identifies this alternative site as the preferred alternative, it would require the Skull Valley Band and PFS to amend the proposed lease.

1.5.3 BLM Federal Action

By letter dated August 28, 1998, PFS applied for separate rights-of-way to provide transportation routes from the Interstate 80 corridor to the proposed PFSF site on the Reservation. The preferred route is a rail line from Skunk Ridge along the base of the Cedar Mountains on the western side of Skull Valley, then east to the proposed site (Figure 1.2). The alternative transportation mode is an ITF located 2.9 km (1.8 miles) west of the intersection of I-80 and Skull Valley Road (see Section 2.2.4.2). At the ITF, SNF would be transferred from railcars to heavy-haul vehicles and transported to the proposed PFSF via Skull Valley Road.

The location of either the rail corridor or the ITF would occupy public land that is included within the BLM Pony Express RMP. The decisions in the current RMP do not provide for a major right-of-way corridor, such as a rail line, along the west side of Skull Valley. The PFS proposal would, therefore, require an amendment to the RMP, *Transportation and Utility Corridor Decision 1*, prior to BLM granting the rail line right-of-way. The amendment would add an exception to the RMP decision to allow the construction and use of the proposed rail line outside the established corridors. This DEIS will serve as the NEPA document for BLM's determinations with respect to both the right-of-way and the proposed plan amendment.

The following planning criteria have been established by BLM to guide the development of the amendment to the Pony Express RMP:

- The Plan will address only BLM lands administered by the Salt Lake Field Office and will not address private lands or lands administered by other government agencies.
- Coordination and cooperation across interagency administrative boundaries will take place in both planning and implementation.
- The public will have an opportunity to provide information and recommendations on the proposal and to review and comment on the proposed action before a final management decision.
- Social and economic impacts to local communities resulting from public land management will be considered.

BLM's action is to issue a right-of-way grant under 43 CFR Part 2800 for the rail line or for the ITF, or deny both applications. If the rail line alternative is selected, BLM will first amend the Pony Express RMP in accordance with 43 CFR Part 1600, and then issue the right-of-way grant. BLM's review of the proposal will consider both technical and environmental issues. After completing its review, BLM will issue a ROD. The BLM also requires that certain "Critical Elements" be considered in this DEIS. Table 1.2 identifies these critical elements; those that have been found to have no effect are not further discussed in this DEIS and the rationale for the disposition of those elements is provided in Table 1.2

1.5.4 STB Federal Action

The STB has regulatory authority over the construction and operation of new rail lines in the United States. The STB would have to grant a license for the construction and operation of PFS's proposed rail line from Skunk Ridge. On January 5, 2000, PFS filed an application with STB for the proposed rail line construction and operation (Finance Docket 33824, *Great Salt Lake and Southern Railroad, L.L.C.–Construction and Operation in Tooele County, Utah*). STB will review both the merits of the proposal and the potential environmental impacts. STB will prepare a ROD providing the basis for its decision to either grant or deny the PFS application with appropriate conditions, including environmental conditions.

1.5.5 Required Agency Consultation

As Federal agencies, the NRC, BIA, BLM, and STB are required to comply with the Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966 (NHPA), as amended. The agencies have initiated consultation with the U.S. Fish and Wildlife Service (FWS) to comply with the requirements of Section 7 of the Endangered Species Act of 1973 (see Appendix B). On June 14, 1999, the cooperating agencies sent a letter to the FWS's Utah Field Office describing the proposed action and requesting a list of threatened and endangered species and critical habitats that could potentially be affected by the proposed action. By letter dated June 22, 1999, the FWS's

Table 1.2. Critical elements identified by BLM and considered in this DEIS

Indirect/direct cumulative effect	No effect	Value	Rationale for BLM's determination of "no effect"
X		Air quality	
X		Threatened and endangered species	
X		Flood plains	
	X	Prime/unique farmland	There are no prime/unique farmlands present in this area.
X		Cultural/historical resources	
	X	Paleontological	No surveys have been performed in this area, and the authorized BLM officer is not aware of any paleontological resources that would be affected by the proposed action.
X		Wilderness	
X		Water resources	
	X	Areas of critical environmental concern (ACEC)	There are no ACECs in western Skull Valley.
	X	Wild & scenic rivers	There are no rivers or creeks in the Cedar Mountains suitable for wild and scenic designation.
X		Native American concerns	
X		Wastes, hazardous/ solid	
X		Environmental justice	
	X	Riparian	There are no riparian areas that would be crossed by the proposed rail corridor. Travel along the existing Skull Valley highway would not directly affect riparian areas
X		Noxious weeds	

Utah Field Office provided a list of threatened, endangered, or conservation agreement species. Any additional consultation with the FWS will be completed prior to issuance of the Final EIS to ensure that the continued existence of any threatened or endangered species potentially affected by this project would not be jeopardized.

The cooperating agencies have initiated the Section 106 consultation process required by the National Historic Preservation Act (see Appendix B). By letter dated May 18, 1999, the NRC, in association with the cooperating agencies, has also initiated the Section 106 process with the Utah State Historic Preservation Office (SHPO). This letter described the potentially affected area and requested the views of the SHPO on further actions to identify historic properties that may be affected. The Utah SHPO responded by letter dated June 24, 1999. The Utah SHPO identified three additional actions it thought the cooperating agencies should take in their effort to identify historic properties that may be affected by the proposed action (see Appendix B).

In response to the Utah SHPO letter, BLM contacted local Federally Recognized Indian Tribes and other interested organizations, by letters dated July 1, 1999, and December 2, 1999, soliciting their interest in being consulting parties in the Section 106 process for the proposed rail line. Two organizations (the Confederated Tribes of Goshute Reservation and the Oregon-California Trail Association) informed BLM that they would like to participate in the consultation process. One organization, the National Rail Association, indicated that they did not want to participate. The National Park Service contacted BLM indicating that it would like to participate in the Section 106 consultation process. By letters dated April 26, 2000, the NRC, in association with BIA and STB, issued follow-on letters that again solicited participation in the Section 106 consultation process. Details of this consultation are presented in Appendix B.

Subsequent to the cooperating agencies letter of May 18, 1999, revised regulations, as issued by the Advisory Council on Historic Preservation, became effective. As a result, NRC and the cooperating agencies recommended in a letter dated November 9, 1999, that the new regulations be implemented for this Section 106 consultation. In a letter dated November 23, 1999, the Utah SHPO agreed to proceed with the consultation pursuant to the revised regulations.

1.6 Federal, Tribal and State Authorities, Regulations, and Permits

This section describes the applicable Federal, Tribal, and State regulations governing the construction and operation of the proposed PFSF and transportation facilities with which PFS must comply. Section 1.6.1 identifies the applicable statutes and regulations that require compliance, while Section 1.6.2 identifies the required permits and provides the status of PFS's applications to obtain these permits. This information was obtained from the PFS's Environmental Report (PFS/ER 2000) and other sources (e.g., PFS/RAI2 1999a).

1.6.1 Statutes and Regulations

1.6.1.1 Federal Laws and Regulations

The proposed PFSF is subject to a number of Federal environmental laws, regulations, and other regulatory requirements. The following list identifies generally applicable laws and regulatory requirements, but it should not be construed as a comprehensive listing because of the early stage of project planning.

- the Atomic Energy Act of 1954 as amended (42 USC 2011 *et seq.*), which gives NRC specific authority to regulate the possession, transfer, storage, and disposal of byproduct and special nuclear materials, as well as aspects of transportation packaging design requirements for these materials, including testing for packaging certification. Commission regulations applicable to the transportation of these materials (10 CFR Parts 71 and 73) require that shipping casks meet specified performance criteria under both normal transport and hypothetical accident conditions.
- NEPA (42 USC 4321 *et seq.*).

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X		Cultural/historical resources	
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X		Wilderness	
X		Water resources	
	X	Areas of critical environmental concern (ACEC)	There are no ACECs in western Skull Valley.
	X	Wild & scenic rivers	There are no rivers or creeks in the Cedar Mountains suitable for wild and scenic designation.
X		Native American concerns	
X		Wastes, hazardous/ solid	
X		Environmental justice	
	X	Riparian	There are no riparian areas that would be crossed by the proposed rail corridor. Travel along the existing Skull Valley highway would not directly affect riparian areas
X		Noxious weeds	

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- NEPA (42 USC 4321 *et seq.*).

- CEQ's general regulations implementing NEPA (40 CFR Parts 1500–1508).
- NRC's regulations implementing NEPA (10 CFR Part 51).
- the Resource Conservation and Recovery Act, as amended (RCRA; 42 USC 6901 *et seq.*), which governs treatment, storage, and disposal of solid waste.
- the Clean Air Act (CAA), as amended (CAA; 42 USC 7401 *et seq.*). The CAA requires (1) Federal agencies to comply with "all Federal, State, interstate, and local requirements" related to the control and abatement of air pollution; (2) the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS); and (3) establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants. It further regulates emission of hazardous air pollutants, including radionuclides, through the National Emission Standards for Hazardous Air Pollutants Program (40 CFR Parts 61 and 63).
- the Clean Water Act (CWA) of 1977 (CWA; 33 USC 1251 *et seq.*), which generally requires (Section 113) all Federal departments and agencies to comply with Federal, State, interstate, and local requirements regarding discharge of pollutants to surface water bodies. Section 402(p) of the CWA (which was added to the CWA by the Water Quality Act of 1987) requires EPA to establish regulations for the Agency or individual States to issue permits for stormwater discharges associated with industrial activity, which includes construction activities that could disturb five or more acres.
- the Endangered Species Act (ESA), as amended (16 USC 1531 et seq.), which protects threatened and endangered species and their habitats from major adverse impacts. The ESA further requires consultation regarding these species with the U.S. Fish and Wildlife Service.
- Executive Order 11512, *National Environmental Policy Act, Protection and Enhancement of Environmental Quality*. The Order directs Federal executive agencies to monitor and control their activities continually to protect and enhance the quality of the environment, and it requires the development of procedures both to ensure the fullest practicable provision of timely public information and understanding of Federal plans and programs with potential environmental impacts, and to obtain the views of interested parties.
- Executive Order 11593, *National Historic Preservation*, directs Federal executive agencies to locate, inventory, and nominate properties under their jurisdiction or control to the *National Register of Historic Places*.
- Executive Order 11988, *Floodplain Management*, directs Federal executive agencies to establish procedures to ensure that any Federal action undertaken in a floodplain considers the potential effects of flood hazards and floodplain management and avoids floodplain impacts to the extent practicable.
- Executive Order 11990—*Protection of Wetlands*; Federal executive agencies are directed to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.
- Executive Order 12088, *Federal Compliance with Pollution Control Standards*. The Order generally directs Federal executive agencies to comply with applicable administrative and procedural pollution control standards established in major Federal environmental legislation, such as the CAA, CWA, and Safe Drinking Water Act (SDWA).
- Executive Order 12898, *Environmental Justice*, which directs Federal executive agencies, to the extent practicable, to make the achievement of environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States, including Federally Recognized Indian Tribes.

- Executive Order 13007, *Indian Sacred Sites*, which directs Federal executive agencies to avoid adverse effects to sacred sites and to provide access to those sites to Native Americans for religious practices.
- Executive Order 13094, *Consultation and Coordination with Indian Tribal Governments*. The Order directs Federal executive agencies to establish regular and meaningful consultation and collaboration with Tribal governments in the development of regulatory practices on Federal matters that significantly or uniquely affect their communities.
- Executive Order 13112—*Invasive Species*; Federal executive agencies, to the extent practicable and permitted by law, are required to, among other things, prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, and develop technologies to prevent introduction and to provide for environmentally sound control of invasive species.
- the Federal Land Policy and Management Act of 1976 (43 USC 1701 *et seq.*), which governs the use of Federal lands administered by BLM. Title II and its implementing regulations in 43 CFR Part 1600 governs land use planning. Title V and its implementing regulations in 43 CFR Part 2800 governs rights-of-way that cross public land administered by the BLM.
- the National Historic Preservation Act (16 USC 470 *et seq.*) and related historic preservation laws [e.g., the Antiquities Act (16 USC 431 *et seq.*)] provide for the protection and preservation of cultural and historic resources.
- the American Indian Religious Freedom Act (42 USC 1996 *et seq.*)
- the Archaeological Resources Protection Act, as amended (16 USC 470aa *et seq.*) would apply if there were any excavation or removal of archaeological resources from publicly held or Native American lands.
- provisions of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) would apply if there were any discoveries of Native American graves or grave artifacts.
- the Noise Control Act of 1972, as amended (42 USC 4901 *et seq.*) would apply to any noise-generating activities carried out during the construction, operation, or closure of the proposed facility.
- the Occupational Safety and Health Act and its implementing regulations.
- NRC's regulations in 10 CFR Part 20, *Standards for Protection Against Radiation,* and in 10 CFR Part 72, *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste.*
- the Pollution Prevention Act of 1990 (42 USC 13101 *et seq.*), which establishes a national policy for waste management and pollution control that focuses first on source reduction, and then on environmentally safe recycling, treatment, and disposal.
- the requirements for the Secretary of the Interior or a delegated representative to approve business leases with Federally Recognized Indian Tribes (25 U.S.C. § 415 and implementing regulations in 25 CFR Part 162).
- the Safe Drinking Water Act (enforcement of drinking water standards has been delegated by EPA to the States; regulations are found at 40 CFR Parts 123, 141, 145, 147, and 149).

Cross-country and local transportation of SNF to the proposed PFSF site would require compliance with the NRC's regulations in 10 CFR Part 71, *Packaging and Transportation of Radioactive Material.* The regulations in 10 CFR Part 73, *Physical Protection of Plants and Materials* govern safeguards and physical security during the transit of shipment of SNF. The transportation aspects of the proposed project would also require compliance with applicable Department of Transportation (DOT) regulations, such as those found in 49 CFR and its subchapters as listed below:

- Chapter I, Subchapter A: *Hazardous Materials Transportation, Oil Transportation, and Pipeline Safety*; Part 107, *Hazardous Materials Program Procedures;*
- Subchapter C: *Hazardous Materials Regulations*; Part 171, *General Information, Regulations, and Definitions*; Part 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements*; Part 173, *Shippers—General Requirements for Shipments and Packagings*, Subpart I, *Radioactive Materials*;
- Part 174, *Carriage by Rail;*
- Part 177, *Carriage by Public Highway.*

Also, the action would be required to comply with the DOT Federal Highway Administration regulations in 49 CFR Chapter III, Subchapter B: *Federal Motor Carrier Safety Regulations*; including:

- Part 390, *Federal Motor Carrier Safety Regulations, General*;
- Part 391, *Qualifications of Drivers*;
- Part 392, *Driving of Commercial Motor Vehicles*;
- Part 393, *Parts and Accessories Necessary for Safe Operation*;
- Part 395, *Hours of Service of Drivers*;
- Part 396, *Inspection, Repair, and Maintenance*; and
- Part 397, *Transportation of Hazardous Materials; Driving and Parking Rules.*

1.6.1.2 Skull Valley Band of Goshute Indians Tribal Statutes and Regulations

Activities that would occur on the Reservation would be required to comply with Tribal laws, regulations, and ordinances, including those Federal laws [e.g., CWA, Safe Drinking Water Act, and CAA] which allow a Tribe to be treated as a sovereign government or subfederal government.

1.6.1.3 State of Utah Statutes and Regulations

Those activities that would take place outside the Reservation (e.g., along the transportation corridor) would be required to comply with applicable Utah statutes and regulations in the Utah Administrative Code under Environmental Quality (Sections R307 to R317).

1.6.2 Required Permits and Approvals

Many of the Federal, Tribal, and State statutes and regulations identified in Section 1.6.1 require permits or approvals to demonstrate compliance. PFS has identified a number of permits and approvals that need to be developed and approved for the proposed action. The sections below list the permits and approvals that have been identified by PFS and the status of PFS's applications to obtain them.

1.6.2.1 Federal Permits and Approvals

U.S. Nuclear Regulatory Commission: A license is required from the NRC. For a more detailed discussion see Section 1.5.1.

U.S. Department of Interior, Bureau of Indian Affairs: BIA approval of the lease between PFS and the Skull Valley Band is needed. For a more detailed discussion see Section 1.5.2.

U.S. Department of Interior, Bureau of Land Management: A right-of-way approval for either a new rail line or an ITF is needed. For a more detailed discussion see Section 1.5.3.

U.S. Surface Transportation Board: The STB would have to approve construction and operation of the new rail line and associated sidings. For a more detailed discussion, see Section 1.5.4.

U.S. Environmental Protection Agency: (1) National Pollutant Discharge Elimination System (NPDES)—Storm Water General Permit associated with construction activities (includes a requirement for a comprehensive Storm Water Pollution Prevention Plan). With respect to all construction activity on the Reservation, a NPDES General Permit is available from EPA Region VIII to cover construction projects disturbing 2 ha (5 acres) or more on all tribal trust lands in Utah. PFS is currently preparing the General Permit application form, and supporting documentation has been secured from EPA Region VIII. A draft of the Pollution Prevention Plan has been prepared. (2) SDWA—All necessary registrations needed to ensure compliance with the Act and its enabling regulations regarding the use of drinking water wells onsite would be secured from EPA Region VIII. (3) Registration of Septic Tank/Leach Fields—Because the two proposed PFSF septic tank/leach field systems would qualify as Class V injection wells, an Underground Injection Control inventory form would be filed with EPA before the systems are placed in service. (4) RCRA—EPA has RCRA authority over activities on the Reservation. The proposed PFSF is not expected to generate large quantities of hazardous wastes (as regulated under RCRA); therefore, the PFSF would likely be classified as a Conditionally Exempt Small Quantity Generator (CESQG). PFS would have to file a "Notification of Regulated Waste Activity" with EPA to seek such status prior to initiating operation. (5) Spill Control—The above-ground diesel fuel tanks for the proposed PFSF will require the development of a Spill Prevention, Control, and Countermeasures (SPCC) Plan. PFS will complete such a plan in accordance with 40 CFR Part 112.

U.S. Department of Interior, Fish and Wildlife Service: No specific permit or approval is needed from the FWS. However, a required consultation process has been initiated between the cooperating agencies and the FWS (see Section 1.5.5).

U.S. Department of Defense, Army Corps of Engineers (ACE): Either a site-specific or general CWA Section 404 permit would be filed for the Skunk Ridge rail line. The permit would be needed because the rail line would use bridges and culverts to cross arroyos and ephemeral streams. PFS intends to file a Joint Application to the Utah State Engineer and the ACE for a Stream Alteration Permit to satisfy the CWA section 401 water quality certification, and for a 404 permit to satisfy the CWA Section 404 permitting statutes.

Utah Department of Environmental Quality: PFS is not expected to generate large quantities of hazardous wastes (as regulated under RCRA). Accordingly, PFS would likely be classified as a Conditionally Exempt Small Quantity Generator (CESQG). To document the proper management and disposal of these wastes, PFS anticipates filing for a RCRA ID number to seek the CESQG classification. The Utah DEQ is responsible for issuing RCRA ID numbers. ERPA Form 8700-12 must be filed with the application for the RCRA ID number. The form has been completed and PFS expects to file the application shortly.

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1.6.1.2 Skull Valley Band of Goshute Indians Tribal Statutes and Regulations

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1.6.1.3 State of Utah Statutes and Regulations

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1.6.2.1 Federal Permits and Approvals

U.S. Nuclear Regulatory Commission: A license is required from the NRC. For a more detailed discussion see Section 1.5.1.

U.S. Department of Interior, Bureau of Indian Affairs: BIA approval of the lease between PFS and the Skull Valley Band is needed. For a more detailed discussion see Section 1.5.2.

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U.S. Environmental Protection Agency: (1) National Pollutant Discharge Elimination System (NPDES)—Storm Water General Permit associated with construction activities (includes a requirement for a comprehensive Storm Water Pollution Prevention Plan). With respect to all construction activity on the Reservation, a NPDES General Permit is available from EPA Region VIII to cover construction projects disturbing 2 ha (5 acres) or more on all tribal trust lands in Utah. PFS is currently preparing the General Permit application form, and supporting documentation has been secured from EPA Region VIII. A draft of the Pollution Prevention Plan has been prepared. (2) SDWA—All necessary registrations needed to ensure compliance with the Act and its enabling regulations regarding the use of drinking water wells onsite would be secured from EPA Region VIII. (3) Registration of Septic Tank/Leach Fields—Because the two proposed PFSF septic tank/leach field systems would qualify as Class V injection wells, an Underground Injection Control inventory form would be filed with EPA before the systems are placed in service. (4) RCRA—EPA has RCRA authority over activities on the Reservation. The proposed PFSF is not expected to generate large quantities of hazardous wastes (as regulated under RCRA); therefore, the PFSF would likely be classified as a Conditionally Exempt Small Quantity Generator (CESQG). PFS would have to file a "Notification of Regulated Waste Activity" with EPA to seek such status prior to initiating operation. (5) Spill Control—The above-ground diesel fuel tanks for the proposed PFSF will require the development of a Spill Prevention, Control, and Countermeasures (SPCC) Plan. PFS will complete such a plan in accordance with 40 CFR Part 112.

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1.6.2.2 Skull Valley Band of Goshute Indians Tribal Permits and Approvals

No specific permits are required at this time.

1.6.2.3 State of Utah Permits and Approvals for Activities Off the Reservation

Utah Department of Environmental Quality: The State of Utah regulates proper disposition of storm water through a Utah Pollution Discharge Elimination System (UPDES) General Permit (UAC R137-8-3.8). The UPDES is required for construction activities that disturb more than 2 ha (5 acres) in order to secure coverage under the UPDES permit authorizing construction-related storm water discharges. Since the construction activities for the rail line or the ITF would exceed this acreage limit, PFS would submit a notice of intent (NOI) at least 48 hours prior to initiation of construction activities. The NOI would be similar in content to the one submitted to the EPA.

Utah Department of Environmental Quality: PFS would be required to file a Joint Application to obtain a Stream Alteration Permit from the Utah State Engineer to satisfy CWA Section 401 water quality certification requirement and to obtain a permit from the ACE to satisfy the provisions of CWA Section 404.

Utah Department of Environmental Quality: PFS is not expected to generate large quantities of hazardous wastes (as regulated under RCRA). Accordingly, PFS would likely be classified as a Conditionally Exempt Small Quantity Generator (CESQG). To document the proper management and disposal of these wastes, PFS anticipates filing for a RCRA ID number to seek the CESQG classification. The Utah DEQ is responsible for issuing RCRA ID numbers. ERPA Form 8700-12 must be filed with the application for the RCRA ID number. The form has been completed and PFS expects to file the application shortly.

Utah Department of Transportation: In the event that heavy-haul vehicles are used to transport licensed SNF shipping casks on Skull Valley Road, a road-use permit would have to be obtained from the State because of the size and weight of the proposed vehicles.

Utah State Historic Preservation Office (SHPO): While a specific permit is not required directly from the SHPO, PFS must comply with the terms of the consultation completed between the cooperating agencies, the Skull Valley Band, and the SHPO (see Section 1.5.5).

State of Utah, Division of Water Rights: Water rights in Tooele County are regulated by the State, which allocates use through water rights processes. Any use of surface water or groundwater in Skull Valley other than on the Reservation by PFS would be subject to these processes.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section presents the details of the proposed action (i.e., construction and operation of the proposed PFSF and the new rail line), as well as reasonable alternatives to the proposed action that have been considered and evaluated in this DEIS. The information presented in this section provides the basic project information upon which the potential impacts have been assessed in Chapters 4, 5, and 6 of this DEIS.

Section 2.1 describes the details of constructing and operating the proposed facility at the Reservation. Most of this information was provided in PFS's Environmental Report (PFS/ER 2000) and Safety Analysis Report (PFS/SAR 2000). Section 2.1 also provides the details of transporting SNF through Skull Valley.

Section 2.2 discusses (a) alternative storage technologies, (b) PFS's site selection process, (c) an alternative location for the proposed PFSF on the Reservation, (d) alternative modes of transporting SNF, and (e) the no-action alternative. Section 2.2 also discusses an alternate site located in Wyoming. The no-action alternative (i.e., not constructing the proposed PFSF or its associated transportation facilities) is included to provide a basis for comparing and evaluating the potential impacts of constructing and operating the proposed facility.

A comparison of the potential environmental impacts of the alternatives is presented in Chapter 9.

2.1 Proposed Action

The proposed action considered in this DEIS is the construction and operation of the proposed PFSF on the Reservation and the construction and operation of a new rail line. Implementation of the proposed action would require the following Federal actions: BLM approval of an amendment to the Pony Express RMP and granting a right-of-way approval for the use of public lands managed by BLM for a new rail line through Skull Valley, STB approval of the construction and operation of this new rail line, the issuance of an NRC license for the proposed PFSF; and BIA approval of a lease for the use of tribal trust lands allowing for the construction and operation of the proposed PFSF. An overview of the proposed project is given in Section 1.2. This section provides a more detailed description of the construction and operation of the proposed PFSF and transportation options. Upon approval by each of the cooperating Federal agencies, PFS would proceed with constructing and operating the proposed PFSF, under conditions prescribed by the BIA, BLM, STB, and NRC, as appropriate.

2.1.1 Proposed Site and Description of Associated Facilities

2.1.1.1 Site Description

The proposed site is approximately 44 km (27 miles) west-southwest of Tooele (see Figure 1.1) and is located on the Reservation within the geographic boundaries of Tooele County, Utah, about 6 km (3.5 miles) west-northwest of the Skull Valley Band Village (see Figure 2.1). Approximately

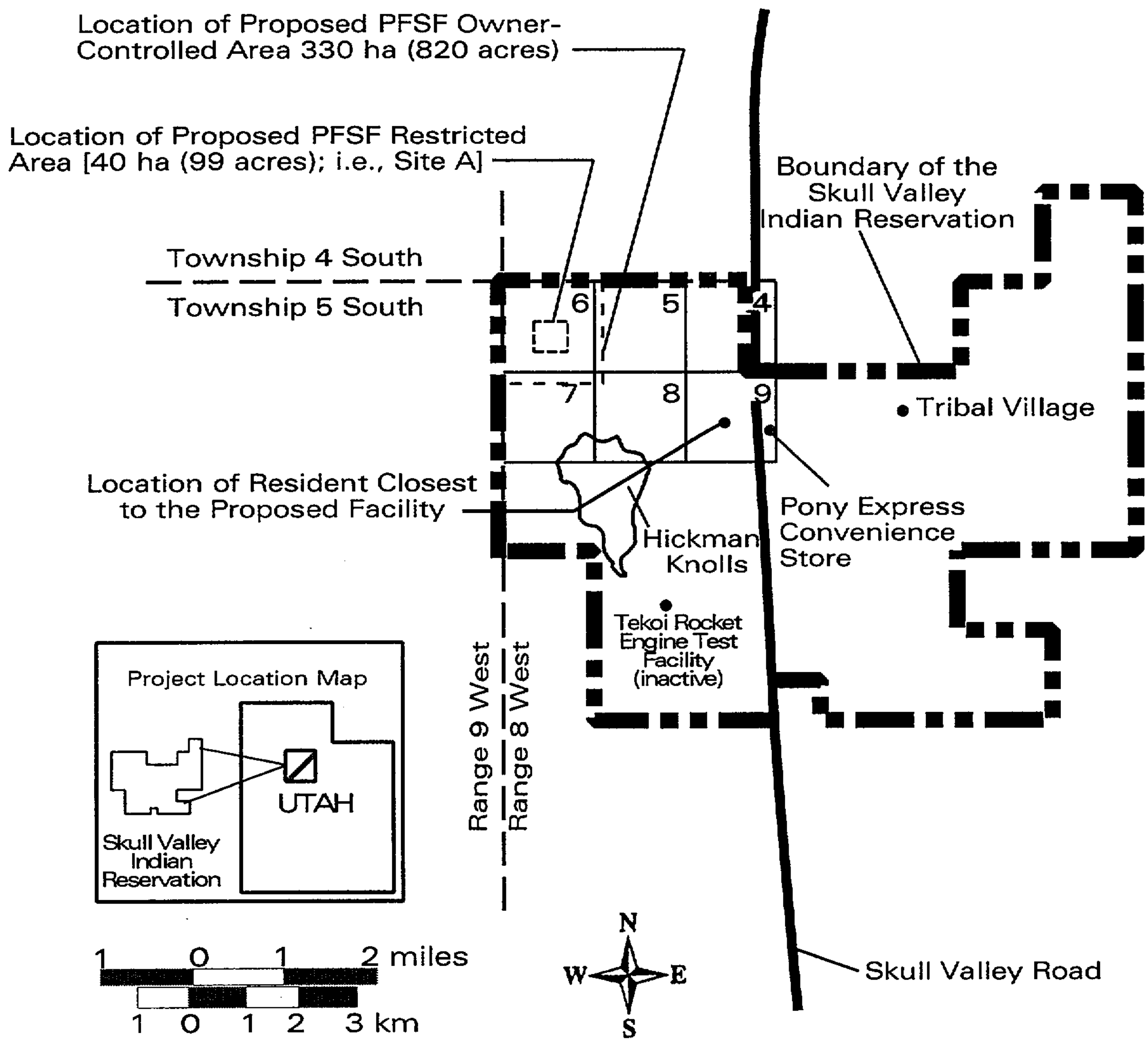


Figure 2.1. Location of the proposed site (i.e., Site A) for the PFSF on the Reservation. 1

30 people live on the Reservation, and the resident nearest to the site is about 3 km (2 miles) to the east-southeast. PFS plans to lease 330 ha (820 acres) from the Skull Valley Band in the northwest corner of the Reservation. As shown in Figure 2.1, the property to be leased occupies all of Section 6 and portions of Sections 5, 7, and 8 in Township 5 South (T5S), Range 8 West (R8W). The northwest corner of the proposed 40-ha (99-acre) facility is at 40° 24' 50" north latitude and 112° 47' 37" west longitude. The area immediately around these sections is undeveloped rangeland owned by the Skull Valley Band, public lands managed by the BLM, and privately owned land.

The site is on a relatively flat valley floor, with elevations ranging from about 1,355 m (4,450 ft) above sea level at the northwest corner of the site to 1,370 m (4,490 ft) at the southeast corner. The Stansbury Mountains [with elevations up to 3,300 m (11,000 ft)] lie approximately 8 km (5 miles) to the east of the site, while the Cedar Mountains [with elevations up to 2,300 m (7,700 ft)] lie about 13 km (8 miles) to the west.

Additional detail on the existing environment at the proposed site is contained in Section 3 in this DEIS.

2.1.1.2 Facility Description

The basic site plan for the proposed PFSF is shown in Figure 2.2. A fence would mark the boundaries of the 330-ha (820-acre) leased area, designated for the purposes of this DEIS as the Owner Controlled Area (OCA)[1], and a 40-ha (99-acre) restricted-access area within the OCA (see Figure 2.1) would contain the storage pads and some of the support facilities. The restricted-access area would be located at the approximate center of the OCA. The entire 330 ha (820-acre) site (OCA) would be enclosed by a typical four-strand barbed wire range fence, which would meet the requirements of the BIA. Fencing around the 40-ha (99-acre) restricted-access area would consist of 2.4-m (8-ft) two chain link security fences topped with barbed wire. The inner fence would be separated from the outer chain link nuisance fence by a 6-m (20-ft) isolation area. A new 4-km (2.5-mile) access road would lie within an 82-ha (202-acre) right-of-way on the Reservation (see Figures 2.1 and 2.2). The road would be built east of the site and would connect the site to the existing Skull Valley Road. No fence would be constructed to enclose the new access road. Buildings and storage areas would primarily be located within the restricted-access area, with the exception of the Administration Building, Concrete Batch Plant, and Operation and Maintenance Building, which would be located outside the security fences. Appropriate portions of the OCA would be landscaped (revegetated), and PFS would develop landscaping plans with the BIA and the Skull Valley Band.

Construction plans. Construction of the proposed PFSF would occur in three phases. Phase 1 would include construction of the major buildings, the storage pads in the southeastern quadrant of the restricted-access area, the access road, a new rail siding and new rail line. The objective of Phase 1 is to provide an operational facility with a portion of the storage pads completed in time to meet the immediate needs of the utilities that would be shipping SNF. The anticipated workforce requirements are shown in Table 2.1. Phase 1 would require a peak work force of up to 255 workers, including 130 workers at the Reservation site and as many as 125 additional workers

[1]For the purpose of this DEIS, OCA is defined as the property to be leased by PFS from the Skull Valley Band.

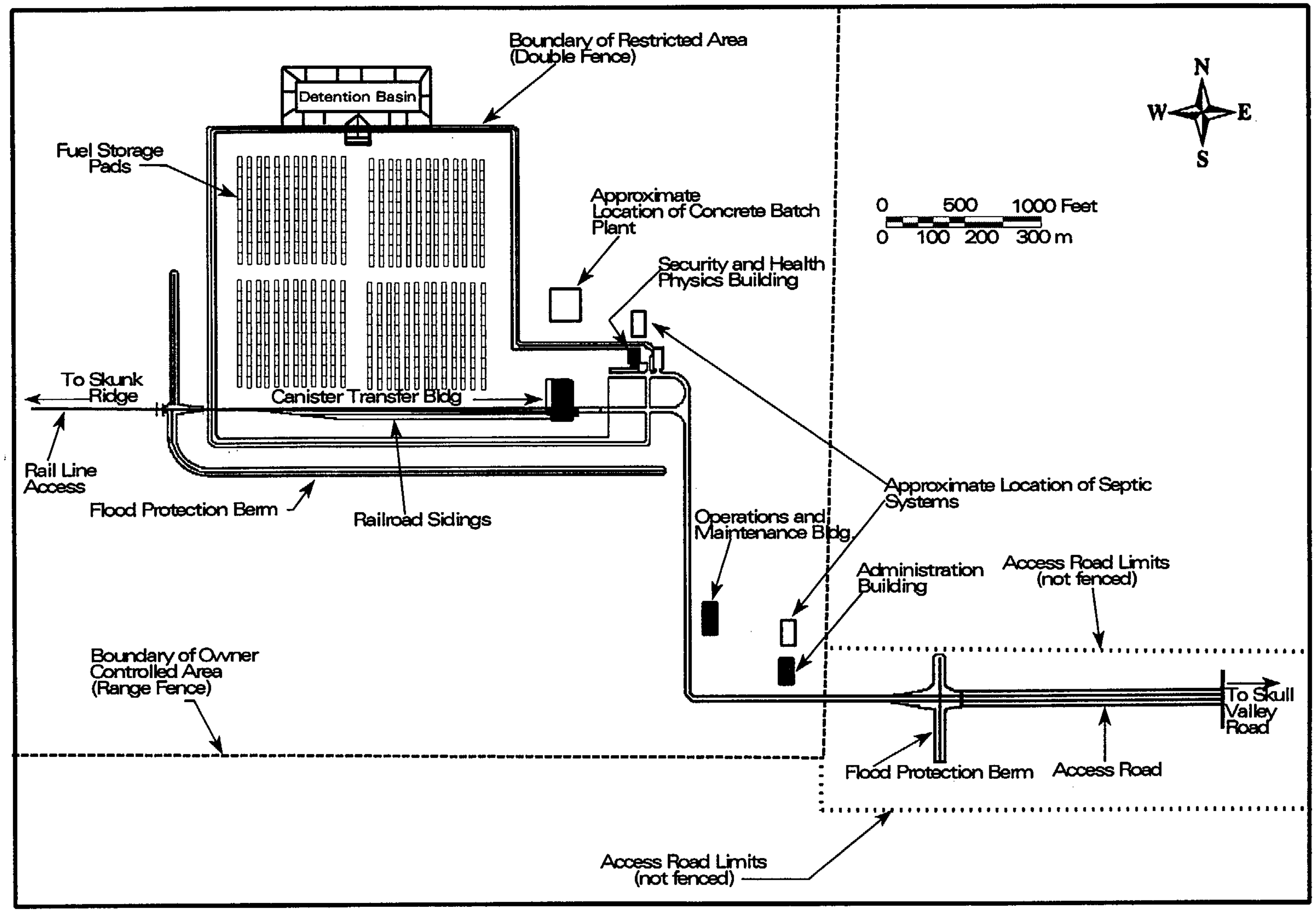


Figure 2.2. Basic site plan and layout of structures and facilities at the proposed PFSF.

Table 2.1. Anticipated peak workforce requirements at the proposed PFSF and new rail corridor

	Construction workers (Phase 1)	Workers during operations (includes Phase 2 and 3 construction)
PFSF	130	43
Rail line	125	2
Total	255	45

for the new facilities that would connect with the existing Union Pacific rail line (see Section 2.1.1.3). Phase 1 would be completed within 2 years. Approximately 66 ha (164 acres) of Reservation land would be affected during construction.

Phase 2 would include construction of storage pads in the southwestern quadrant of the restricted-access area, and Phase 3 would include construction of the remaining storage pads (the two northern quadrants). The timing for initiating Phases 2 and 3 would depend on the anticipated needs of the utilities for additional SNF storage capacity. PFS currently estimates the duration of both Phase 2 and Phase 3 construction to be 5 years. The construction work force for Phases 2 and 3 activities is estimated to be about 43 workers. As shown in Figure 2.2, a concrete batch plant would be located to the east of the restricted-access area throughout the lifetime of the facility to provide concrete for construction of the facilities and the storage casks. The footprint of this batch plant would encompass approximately 0.8 ha (2 acres) and would be sized for a maximum capacity of 57 m^3 (75 yd^3) per hour.

Table 2.2 describes the types and quantities of construction materials to be used during the construction of the proposed PFSF project. PFS plans to obtain materials from private, commercial sources in and around Skull Valley and the Tooele area (PFS/ER 2000). While it would be premature to attempt an identification of the likely sources of construction materials for the proposed action, PFS has conducted a study/survey of possible sources of aggregate that could be used for construction of railroad beds, roads, base for building foundations, and aggregate for concrete (see Section 3.1.4).

Storage pads and casks. When fully completed, the proposed facility would contain modular concrete storage pads that would be 19.5 × 9 × 1 m (64 × 30 × 3 ft) as shown in Figure 2.3. Each storage pad would be constructed approximately flush with [i.e., about 9 cm (3.5 inches) higher than] grade level and would hold up to eight storage casks in a 2 × 4 array. Modular concrete storage pad design provides for ease of construction by limiting the number of concrete pad construction and/or expansion joints required and allows for staged construction of the facility (PFS/SAR 2000). Five hundred such pads would be arranged in four major blocks (or quadrants), resulting in a total capacity for the facility of 4,000 storage casks. Areas between the storage pads would be surfaced with a 30-cm (12-inch) thickness of compacted crushed rock and sloped toward the north to facilitate drainage.

As described in greater detail in Section 2.1.2.2, the storage casks would be cylindrically shaped concrete and steel structures, approximately 3.4 m (11 ft) in diameter and 5.8 m (19.3 ft) high. The steel liners of the casks would be manufactured off-site and transported to the proposed PFSF. The

Table 2.2. Materials to be imported and used in the construction of the proposed PFSF and the Skunk Ridge rail line

	PFSF construction				
Material type	Phase 1 (approx. 19 months)	Phase 2 (approx. 5 years)	Phase 3 (approx. 5 years)	**Construction of rail access corridor from Skunk Ridge**	**Total material required**
Concrete aggregate					
Small (sand)	16,000 m^3 (21,000 yd^3)	36,000 m^3 (47,500 yd^3)	45,500 m^3 (59,500 yd^3)	0	97,500 m^3 (128,000 yd^3)
Large (crushed rock)	22,000 m^3 (29,000 yd^3)	51,000 m^3 (66,500 yd^3)	63,000 m^3 (83,000 yd^3)	0	136,000 m^3 (178,500 yd^3)
Total concrete aggregate	38,000 m^3 (50,000 yd^3)	87,000 m^3 (114,000 yd^3)	108,500 m^3 (142,500 yd^3)	0	233,500 m^3 (306,500 yd^3)
Crushed rock					
Access road base	17,000 m^3 (22,000 yd^3)	0	0	0	17,000 m^3 (22,000 yd^3)
Storage and buildings area grading	40,000 m^3 (53,000 yd^3)	0	0	0	40,000 m^3 (53,000 yd^3)
Storage area grading	0	23,000 m^3 (30,500 yd^3)	41,000 m^3 (53,500 yd^3)	0	64,000 m^3 (84,000 yd^3)
Total crushed rock	57,000 m^3 (75,000 yd^3)	23,000 m^3 (30,500 yd^3)	41,000 m^3 (53,500 yd^3)	0	121,000 m^3 (159,000 yd^3)
Common fill materials	92,000 m^3 (121,000 yd^3)	0	20,000 m^3 (26,000 yd^3)	0	112,000 m^3 (147,000 yd^3)
Sub-ballast	0	0	0	172,000 m^3 (225,000 yd^3)	172,000 m^3 (225,000 yd^3)
Ballast	0	0	0	73,000 m^3 (95,700 yd^3)	73,000 m^3 (95,700 yd^3)
Asphalt paving	11,500 m^3 (15,000 yd^3)	0	0	0	11,500 m^3 (15,000 yd^3)

Source: PFS/ER 2000; Table 4.1-6.

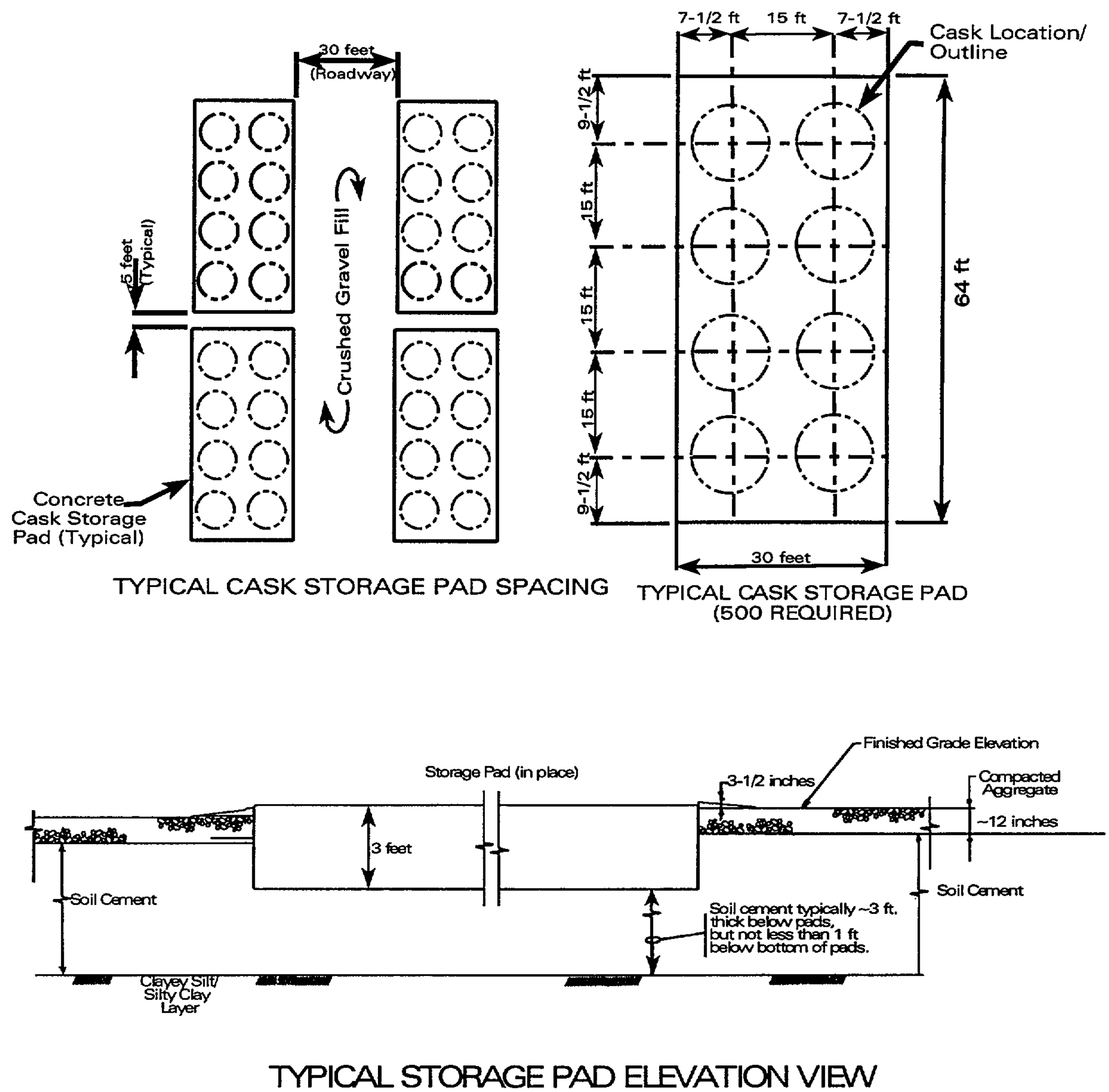


Figure 2.3. Storage pad detail. Note: 1 ft = 0.3048 m

storage casks would be assembled on-site using concrete from the batch plant and the steel liners supplied by the cask vendor. The casks would be assembled at the batch plant on an as-needed basis.

Principal buildings. In addition to the storage pads described above, there would be four buildings that would be constructed as part of the proposed facility (see Figure 2.2): the Canister Transfer Building, the Security and Health Physics Building, the Operations and Maintenance Building, and an Administration Building. Each of these structures would be designed according to its intended function. The function of each building is described in the paragraphs below.

The Canister Transfer Building (see Figure 2.2) would be a massive, reinforced-concrete, high-bay structure approximately 60-m (200-ft) wide, 80-m (260-ft) long, and 23-m (75-ft) high. This building would facilitate the transfer of the SNF canister from its shipping cask into the storage cask. To support the operations described in detail in Section 2.1.2.2, the Canister Transfer Building would be equipped with a 180-metric-ton (200-ton) overhead bridge crane for moving the shipping casks, a 135-metric-ton (150-ton) semi-gantry crane for canister transfer operations, and three canister transfer cells to provide a radiation-shielded work space for transferring the SNF canisters from the shipping casks to the storage casks. Shipping casks would be moved into the high bay portion of the building either on railcars or heavy/haul trailers, depending on which transportation option is chosen.

The Security and Health Physics Building would be the entrance point for the 40-ha (99-acre) restricted-access area. The building would be located adjacent to the Canister Transfer Building and would consist of a single-story, concrete masonry structure approximately 23 m (76 ft) wide, 37 m (120 ft) long, and 5.5 m (18 ft) high. This building would provide office and laboratory space for security and health physics staff and would house security, communication, and electrical equipment needed for these personnel.

Both the Administration Building and the Operations and Maintenance Building would be located outside the restricted-access area. The Administration Building would consist of a single story, steel frame building approximately 24 m (80 ft) wide, 46 m (150 ft) long, and 5 m (17 ft) high, and would include office and records management space, an emergency response center, meeting rooms, and a cafeteria. The Operations and Maintenance Building would consist of a single story, steel frame building approximately 24 m (80 ft) wide, 61 m (200 ft) long, and 8 m (26 ft) high. This building would house maintenance shops and storage areas for spare parts and equipment to service vehicles and equipment at the facility.

Paved parking areas would be constructed adjacent to the Administration Building, the Operations and Maintenance Building, and the Security and Health Physics Building. The paved area at the Administration Building would cover 0.3 ha (0.8 acres). The paved area at the Operations and Maintenance Building would occupy 1 ha (2.5 acres), including a 0.2-ha (0.5-acre) asphalt lay down area. The paved area at the Security and Health Physics Building would cover 0.08 ha (0.2 acre).

Foundations and footings. Field investigations indicate that the soils underlying a silty layer at the surface of the proposed PFSF site are suitable for supporting the proposed structures; therefore, no special construction techniques would be required for improving the subsurface conditions below this silt layer. The footings and foundation for the Canister Transfer Building would be founded on the clayey layer beneath the silt layer. However, the silt layer, in its *in situ* loose state, is not a suitable foundation for the proposed structures, and improvements would be required to enhance the strength of this silt layer. Instead of completely excavating the silt layer from the storage pad emplacement area and replacing it with suitable structural fill, the excavated silt would be mixed with sufficient portland cement and water and compacted to form a strong soil-cement subgrade (with approximately 6.25 percent cement by weight) to support the cask storage pads. The required characteristics of the soil-cement can be easily engineered during detailed design to meet the necessary strength requirements.

Using soil-cement to stabilize the silt layer would reduce the amount of spoil materials generated, would create a stable and level base for storage pad construction, and would substantially improve the sliding resistance of the storage pads. The soil-cement would also be used to replace the compacted structural fill that was included in the original plan between the rows of pads, thus reducing the number of truck trips that would be required to import fill material.

Access road, flood protection structures, and erosion control structures. An 82-ha (202-acre) right-of-way between the leased 330-ha (820-acre) site and Skull Valley Road would contain an access road to the proposed facility and overhead power and telephone lines. Construction of the road would require clearing an area of about 9 ha (22 acres). During initial construction, the access road would be built with a gravel surface and paved with asphalt at the end of major Phase 1 site earthwork. The road would consist of two 4.5-m (15-ft) lanes. Parking areas around the Administration Building, Security and Health Physics Building, and the Operation and Maintenance Building would be surfaced with asphalt or concrete. PFS plans to obtain asphalt for paving the access road and parking lots from existing asphalt plants in the area (PFS/ER 2000).

An earthen diversion berm would be built (from materials removed from the storage pad area) around the uphill sides of the storage area (i.e., along the south and west sides, as shown in Figure 2.2) to protect the site from PMF events by diverting storm runoff away from the storage pads and into the natural drainage basin located to the north. (The rail line access would be constructed to pass over the berm.) This L-shaped berm would be about 15 m (50 ft) wide, 1,310 m (4,300 ft) long, and 1.5 m (5 ft) high. The top of this berm would be at an elevation of 1,365 m (4,480 ft) above sea level. The earthen berm would be covered with riprap (i.e., loosely assembled, large pieces of broken or crushed stone) to resist wind erosion, as well as water erosion from runoff during storms.

A second, separate earthen berm would be built (from materials removed from the storage pad area) perpendicular to the access road about 230 m (750 ft) east of the site boundary (see Figure 2.2), but within the access road right-of-way, to divert flood runoff originating from the Stansbury Mountains. The access road would pass over the berm. This berm would span a local topographical low between existing ridges and would be about 19.5 m (64 ft) wide, 580 m (1,900 ft) long, and a maximum of 2.7 m (9 ft) high. The top of this berm would be at an elevation of 1,374 m (4,507.5 ft) above sea level, and it too would be covered with riprap. Specific details regarding the design and construction of the berms are given in PFS's SAR (PFS/SAR 2000) and the NRC's SER (NRC/SER 2000). These reports address safety issues associated with potential flooding at the proposed facility.

On-site drainage at the storage pad area would be conveyed by a surface flow system to a 3-ha (8-acre) stormwater collection and detention basin to be located at the northern boundary of the restricted-access area (see Figure 2.2). Water collected in this detention basin would be allowed to either evaporate or percolate into the ground. The detention basin would be 245 m (800 ft) wide and 60 m (200 ft) long, and 3 m (10 ft) deep. The basin would be designed for a 100-year storm event.

Water drainage from the storage site as a result of a typical rainstorm is expected to soak into the ground before it reaches the detention basin. In the event of excessive rainfall or snowmelt that results in standing water in the detention basin, PFS has committed to pumping out the collected water. The basin would be constructed with compacted soil and would have side slopes of 10 to 1. The gradual side slopes would reduce the velocity of the rain water flowing into the basin, thereby reducing the potential for wind or water erosion. The sides and bottom of the detention basin would be planted with crested wheatgrass to provide additional stabilization.

Utilities and other services. Lighting would be designed for the security, monitoring, and surveillance of the storage casks. Lighting for the 40-ha (99-acre) restricted-access area would be provided by lights atop 40-m (130-ft) poles located at the perimeter of the area. The light fixtures would be downcast and shielded to minimize light pollution.

Electrical power for lighting, the security system, equipment operation, and other general purposes would be obtained from a new transformer that would be connected with new lines on standard poles to the existing 12.5-kV distribution line that runs along Skull Valley Road. Backup power for the security system, emergency lighting, and the site public address system would be provided by a diesel generator located in the Security and Health Physics Building. The communication system would consist of telephones, a public address system, and short-wave radio equipment.

Heating for the buildings would be accomplished by electric units or by propane heater units. The Canister Transfer Building would be heated electrically, while propane tanks would be located near each of the other three buildings to provide space heating for those structures.

A potable water supply system would be provided for the facility, taking water from either a groundwater well on the site or off-site sources. Because it is unlikely that a well drilled into the mid-valley aquifer would yield adequate quantities of water on demand, above-ground storage tanks would be erected for potable water, water for use in extinguishing fire, and water for the concrete batch plant. The water tanks would likely be located outside the restricted-access area between the concrete batch plant and the restricted-access area fence. A fire suppression system in the Canister Transfer Building would be fed by fire pumps and by a primary and a backup water tank to be located outside the restricted-access area.

Water requirements at the proposed PFSF would be similar to a light industrial facility having a 24-hr per day workforce, with the greatest water use being during construction for dust suppression and operation of the concrete batch plant. Projected water usage is shown in Table 2.3. Maximum daily water use for construction of the proposed PFSF would occur at the beginning of Phases 1, 2, and 3 of the construction schedule and would require as much as 690 m^3/day (182,600 gal/day) of which 678 m^3/day (179,000 gal/day) would be supplied from private off-site sources and 14 m^3/day (3,600 gal/day) would be supplied from an on-site well. The peak daily water consumption from the on-site well during construction would occur during Phase I and would be 35 m^3/day (9,300 gal/day). The average water withdrawal rate from the well would be about 7 m^3/day (1,720 gal/day), 1.2 gpm, or 1.9 acre-ft/year. Construction of the new rail line from Skunk Ridge would require a peak daily water use of 625 m^3/day (165,000 gal/day), which would primarily be used for soil compaction and wetting of haul roads to minimize dust emissions. Additional water would be required for making concrete for culverts on the rail line. The quantity of water required for making this concrete is minimal in terms of the project requirements. Water would also be required during the proposed revegetation of the site and the rail corridor; however, estimated quantities will be available only upon

Table 2.3. Summary of water requirements during construction of the proposed PFSF

Phase of construction	Construction period	Estimated water use[a] [m^3/day (gal/day)]	Estimated water use from on-site wells [m^3/day (gal/day)]
Phase 1	Period 1; first 6 weeks	690 (182,600)	13 (3,300)
	Period 1; following 2 weeks	87 (22,900)	13 (3,300)
	Period 2; first 5 months	109 (28,900)	35 (9,300)
	Period 2; following 2 months	71 (18,700)	35 (9,300)
	Period 3; first 2 months	95 (25,100)	21 (5,500)
	Period 3; following 7 months	56 (14,900)	21 (5,500)
Phase 2	Period 1; first 6 weeks	691 (182,600)	14 (3,600)
	Period 2; following 5-year period	23 (6,100)	23 (6,100)
Phase 3	Period 1; first 12 weeks	691 (182,600)	14 (3,600)
	Period 2; following 5-year period	27 (7,100)	27 (7,100)

[a]Usage includes water for soil compaction, soil cement, dust control, concrete, and worker consumption.

finalization of the revegetation plan prior to construction. The amounts of water that would be needed during revegetation would be small with respect to the total water requirements of the proposed project. Water for worker use and for concrete could be obtained from new on-site wells; the remaining water, suitable for construction uses, would be obtained from off-site sources. In the event that on-site water quality or quantity are inadequate, potable water would be obtained directly from the Reservation's existing water supply, or additional water well(s) would be drilled east of the site, outside the OCA, but still within the Reservation boundaries. If such additional wells are needed on the Reservation, they would need to be approved by BIA and would be subjected to a separate environmental review under NEPA. Alternative or additional sources of water are available from private sources within 9 km (15 miles) of the proposed PFSF site or the site of the new rail line construction (PFS/ER 2000).

A sanitary drainage system, using underground pipes, would be installed to serve the proposed buildings and to transmit liquid wastes to underground septic systems. Two separate septic tank and drain-field systems would be constructed to collect and process the sanitary waste water. One system would be constructed near the Security and Health Physics Building to serve the storage portion of the facility, and another system would be constructed near the Administration Building to serve the balance of the facility. The underground septic system would require clearing a total area of about 0.8 ha (2 acres). The two septic systems, each with a capacity to serve approximately 20 people, would be expected to process less than 19 m^3/day (5,000 gal/day). The size of these systems will require an Underground Injection Control registration with EPA.

A 4-m^3 (1,000-gal) aboveground diesel fuel oil storage tank would be located inside the restricted-access area adjacent to the Security and Health Physics Building and would supply fuel for the cask transporter to be used in moving the storage casks onto the storage pads. This tank would be supplied with fuel from a regional bulk fueling service. No on-site locomotive fuel storage would be provided. The locomotives would be refueled off-site by tanker trucks provided by a regional bulk fueling service.

2.1.1.3 New Rail Line

PFS has proposed to transport SNF from the existing Union Pacific rail line at the north end of Skull Valley to the proposed PFSF by rail. PFS's proposed option is to build a new rail line to the site from the existing, main rail line at Skunk Ridge (near Low, Utah), southward along the west side of Skull Valley and then eastward across the valley to the site (see Figure 1.2).

Currently, there is no existing rail service to the Reservation. The nearest rail line is the Union Pacific Railroad approximately 39 km (24 miles) to the north (see Figure 1.2). PFS proposes to construct a new rail siding to connect to the existing Union Pacific main line at Skunk Ridge, near Low, Utah, and a new rail line that would run to the proposed PFSF site through public lands administered by BLM on the eastern side of the Cedar Mountains. The descriptions below are taken from PFS's right-of-way application and Plan of Development for the new rail line (Donnell 1999; Hennessy 1999).

Construction of the new rail line is expected to last about 14 months. A peak workforce of 125 workers would be needed during the construction period, primarily for earthwork. The types of equipment to be used include bulldozers, scrapers, dump trucks, front-end loaders, compactors, graders, and water trucks. Other work activities would be associated with laying the sub-ballast and ballast (i.e., the foundation and bed) for the track, and laying the track.

The proposed right-of-way for the rail line would be approximately 51 km (32 miles) long and 60 m (200 ft) wide. An additional "temporary use area" of 15 m (50 ft) on each side of the 60-m (200-ft) permanent right-of-way would also be needed for topsoil stockpiles and other construction uses. These additional use areas would be needed only until the end of the 14-month construction period.

For the construction of the rail line, approximately 314 ha (776 acres) within the proposed 60-m (200-ft) right-of-way would be cleared. This does not include any clearing within the 15-m (50-ft) "temporary use area" on both sides of the right-of-way because PFS has proposed only limited and minor uses of this area. About 63 ha (155 acres) of the right-of-way would be disturbed for the life of the project. Approximately 251 ha (621 acres) of the right-of-way would be revegetated after construction of the rail line has been completed. Clearing of the right-of-way would involve the removal and disposal of vegetation along the 12-m (40-ft) wide rail bed, at cut and fill areas, and at soil stockpile locations within the temporary use areas. Woody vegetation would be shredded and scattered in place. Ravines and other features would be reestablished after construction.

A new rail siding would be constructed at Skunk Ridge within the proposed 60-m (200-ft) right-of-way and would consist of two single tracks spaced 4.5 m (15 ft) apart and parallel to the proposed new rail line (see Figure 2.4). The total length of the new siding would be about 760 m (2,500 ft). Other than the new track, no new structures would be constructed at the proposed Skunk Ridge rail siding.

Other than an unimproved road, there is no existing access from the Low interchange of Interstate 80 to the site of the proposed rail siding. The unimproved road consists of unmaintained

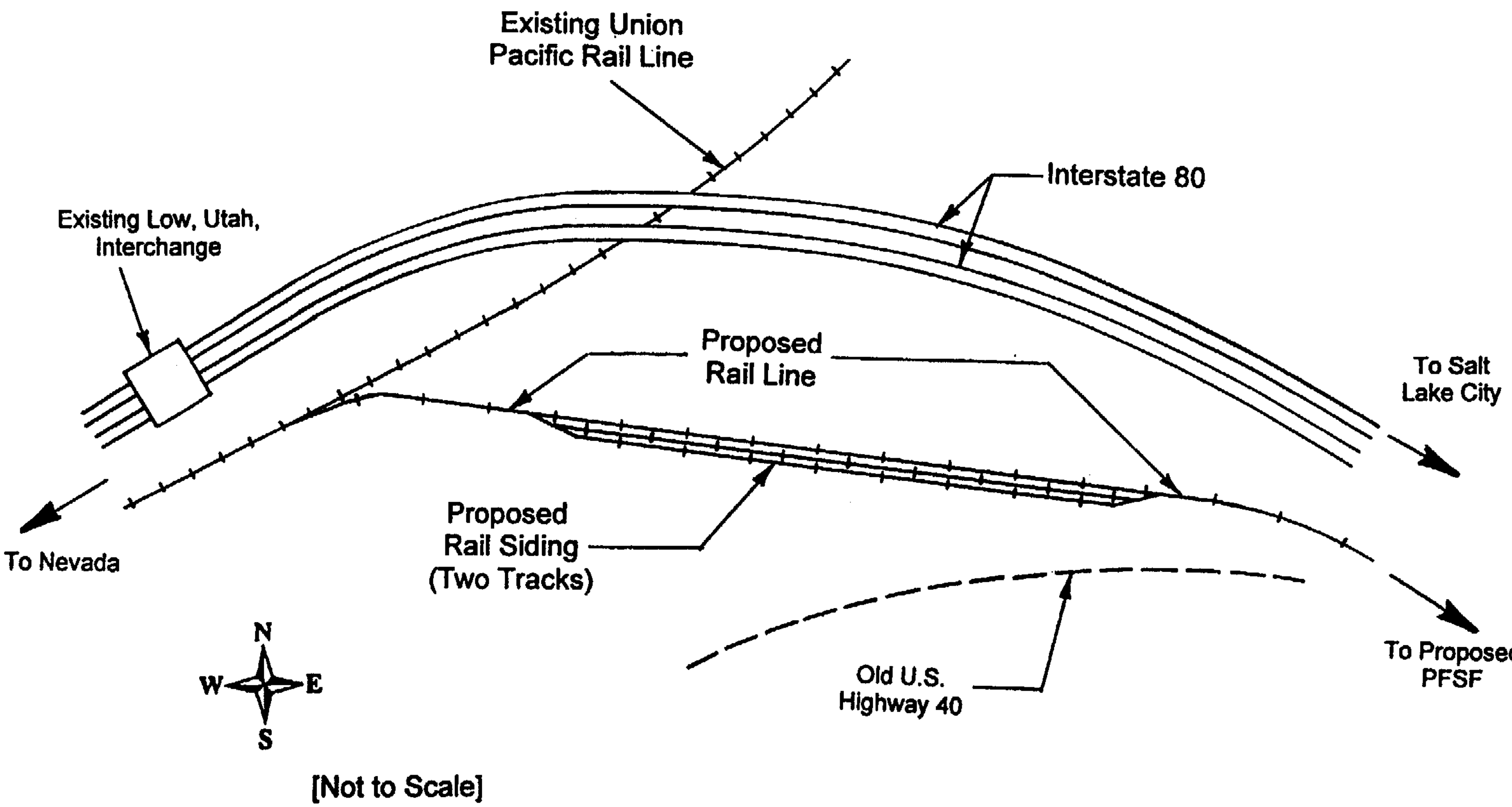


Figure 2.4. Basic site plan and layout for the proposed rail siding near Skunk Ridge, Utah.

portions of the former U.S. Highway 40. PFS proposes to use the area at the Low interchange to unload construction vehicles and to move them to the construction site by using the existing unimproved road. The existing Union Pacific main line passes beneath Interstate 80 at 6 to 9 m (20 to 30 ft) below grade level near the location of the proposed new siding. The new siding would require extensive excavation to connect the new rail line to the existing main line just south of the interstate. Approximately 200,000 m^3 (261,000 yd^3) of material would have to be removed. This material would be expected to serve as fill material for the northern portion of the proposed new rail line near the new siding.

The bed for the new rail line would be approximately 12 m (40 ft) wide. The rail bed would be composed of a standard 4-ft, 8.5-in gauge single track, a 5-m (17-ft) wide layer of ballast material, a 10-m (34-ft) wide layer of sub-ballast material, and a 1-m (3-ft) wide cleared area on each side of the sub-ballast (see Figure 2.5).

Any of the remaining right-of-way which is disturbed during construction would be revegetated using the native seed mix recommended by BLM. The top of the completed rail line would be approximately 1.4 m (4.5 ft) above the surrounding terrain.

The ballast and sub-ballast for the new rail line would be composed of crushed gravel or rock and would be obtained from an existing commercial gravel pit in the area. Approximately 172,000 m^3 (225,000 yd^3) of sub-ballast and 73,000 m^3 (95,700 yd^3) of ballast would be needed.

The proposed rail alignment crosses relatively flat terrain. Except for the area near the proposed siding, which would require excavation as described above, relatively few cuts and fills would be necessary. An attempt would be made to balance the expected volume of cuts and fills to minimize the need for additional fill material. It is estimated that the total amount of cut material would be about 676,000 m^3 (884,000 yd^3) [including the 200,000 m^3 (261,000 yd^3) near the new rail siding, as discussed above]. The total amount of fill material expected to be needed would be about 480,000 m^3 (628,000 yd^3); thus, a surplus of material would be generated [about 196,000 m^3 (256,000 yd^3)]. PFS has indicated that all excess material would be used as embankment dressing, however, the amounts of estimated cut and fill material will be revised and refined in the future to ensure this is possible. In any event, BLM would require that any excess material not used for embankment dressing or other useful purposes be removed from the right-of-way.

The rail line would cross 32 arroyos (i.e., gullies or gulches cut by ephemeral streams) at which drainage culverts designed to the 100-year flood would be installed. Applicable permits for this construction would be required from the Army Corps of Engineers in compliance with the CWA (see Section 1.6). The rail line would cross two improved gravel roads, as well as seven dirt roads and/or four-wheel trails. At-grade crossings would be constructed so as not to impair travel on these roads and trails. The trains using the proposed new rail line would be limited to speeds of 32 km/hr (20 mph), and travel on the crossroads is extremely light; therefore, there would be no installation of such devices as lights or barriers. A standard, cross-buck railroad crossing sign would be erected at each grade crossing.

The rail line would not be fenced, and no access road along the rail line would be provided. Access for maintenance purposes would be accomplished by existing roads in the area and by railroad (i.e., hi-rail) vehicles moving along the track.

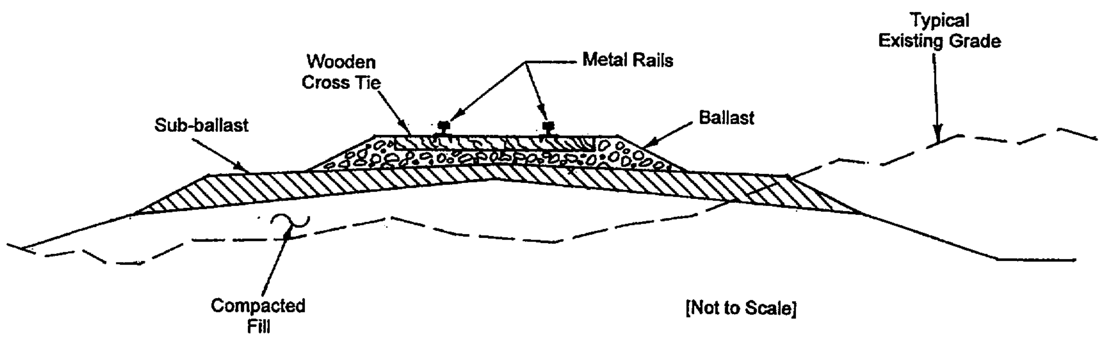


Figure 2.5. Typical cross-section for proposed new rail corridor.

2.1.1.4 Land Use Requirements

Table 2.4 summarizes the amount of land potentially disturbed by the proposed activities to construct the proposed PFSF, the new access road to the proposed PFSF, and the new rail siding and new rail line. Land areas that would be disturbed at the location of the proposed PFSF and its access road would be on the Reservation, under the jurisdiction of the Skull Valley Band. (Title to the land is held by the United States in trust for the Band.) Land areas to be disturbed at the new rail siding would be managed by the BLM. In addition, BLM manages the land that would be used for the new rail line between Skunk Ridge and the proposed PFSF.

Table 2.4 shows the amounts of land that would be cleared and revegetated after construction, as well as the amounts of land that would remain cleared for the life of the project.

2.1.2 Operation

Testing and startup of the proposed PFSF is planned to begin two years after construction commences, followed by the first commercial operations six months later. Operation of the proposed PFSF, which would require a workforce of about 43 people, would involve receiving, transferring, and storing the SNF as described in the following subsections.

A general discussion of SNF transportation is provided below to give an overview of the complete operation. In addition to the operations described below for receiving SNF at the proposed PFSF, once DOE develops a permanent repository, operations would include transferring the stored SNF canisters to vendor-supplied, NRC-certified shipping casks and transporting them from Skull Valley to the DOE facility. (Shipping casks—unlike storage casks—would not be manufactured on site.) Shipments away from Skull Valley would be accomplished by reversing the order of operations used for the receipt of SNF at the proposed PFSF in Skull Valley.

Table 2.4. Potential land areas involved in construction of the proposed facility and the associated rail corridor

Facility/component	Hectares (acres) to be cleared	Hectares (acres) to be revegetated after construction	Hectares (acres) to remain cleared for life of project
Main facility[a] and access road[b] from Skull Valley Road	94 (232)	37 (92)[c]	57 (140)
New 51-km (32-mile) rail line[d] from Skunk Ridge to proposed PFSF on the Reservation	314 (776)	251 (621)	63 (155)

[a]Includes construction within the 40-ha (99-acre) restricted-access area and its fire barrier (crested wheatgrass) and perimeter road/isolation area, the PMF berms, and the storm water detention basin.

[b]Includes construction within the 82-ha (202-acre) right-of-way between the proposed facility and Skull Valley Road.

[c]Includes 100 m (300 ft) fire barrier around the outer edge of the perimeter road around the restricted-access area.

[d]Includes a new rail siding to be constructed within the 60-m (200-ft) right-of-way for the proposed new rail line at Skunk Ridge.

2.1.2.1 Transportation of Spent Fuel to the Proposed PFSF

PFS proposes to use a dual-purpose canister system (see the discussion in the dialogue box in this section) to transport the SNF from PFS member utilities and possibly other existing nuclear reactor locations (see Figure 1.3) to the proposed PFSF. PFS plans to ship SNF from reactor sites to the proposed PFSF by railcar only. The sequence of operations is illustrated in Figure 2.6 and discussed in the following paragraphs.

At the originating reactor site, multiple SNF assemblies would be loaded into a metal canister, and the canister would be prepared for shipping (see Item Nos. 1 through 3 in Figure 2.6). This is done by surveying the canister for contamination, decontaminating as needed, filling the canister with helium, and then welding it shut (see Item Nos. 4 and 5 in Figure 2.6). The canister would then be placed into a certified shipping cask (see Item No. 6 in Figure 2.6) that is protected by impact limiters, loaded onto a shipping cradle, and then attached horizontally to a railcar for shipment to the proposed PFSF in Skull Valley (see Item No. 7 in Figure 2.6). The proposed shipping casks are made of steel and weigh up to 160 metric tons (180 tons) when loaded with the SNF and the canister. For reactor sites without direct rail access, the shipping cask would be loaded onto a heavy-haul vehicle or barged and transported to a nearby rail line where the cask would be loaded onto a railcar for transport to the proposed PFSF. If a reactor site cannot accommodate the shipping cask proposed by PFS, the utilities would load SNF (in the SNF pool) into smaller "transfer" casks and then, using a dry transfer system, move the fuel from the smaller "transfer" casks into the larger shipping cask.

On average, approximately 150 (but no more than 200) loaded shipping casks would be received at the proposed facility each year. Shipments would arrive at Skull Valley via one of the rail routes shown in Figure 2.7. For these shipments, PFS would use two, single-purpose, dedicated trains

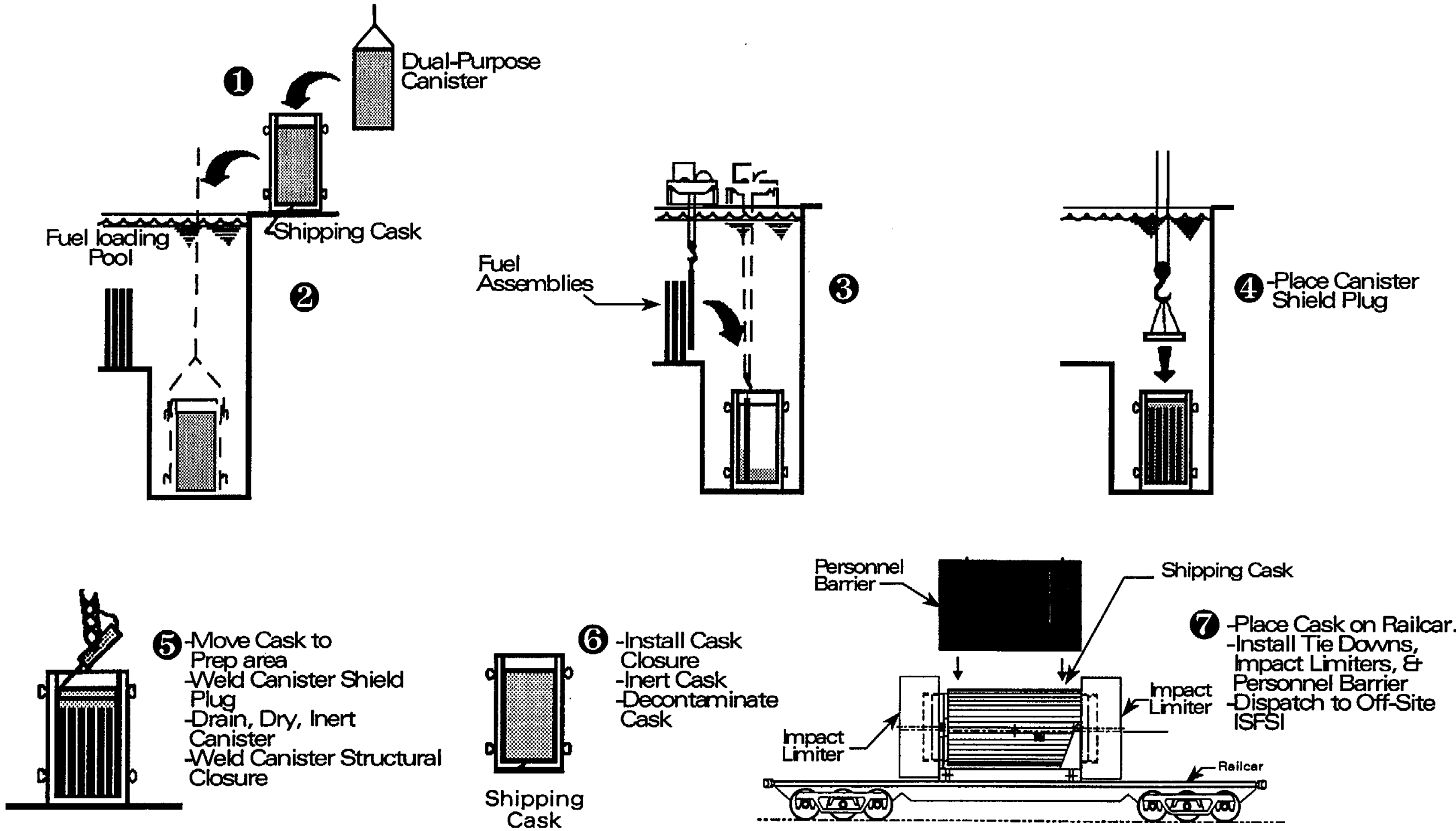


Figure 2.6. Sequences of canister handling and transfer operations for the movement of spent nuclear fuel from existing reactor sites.

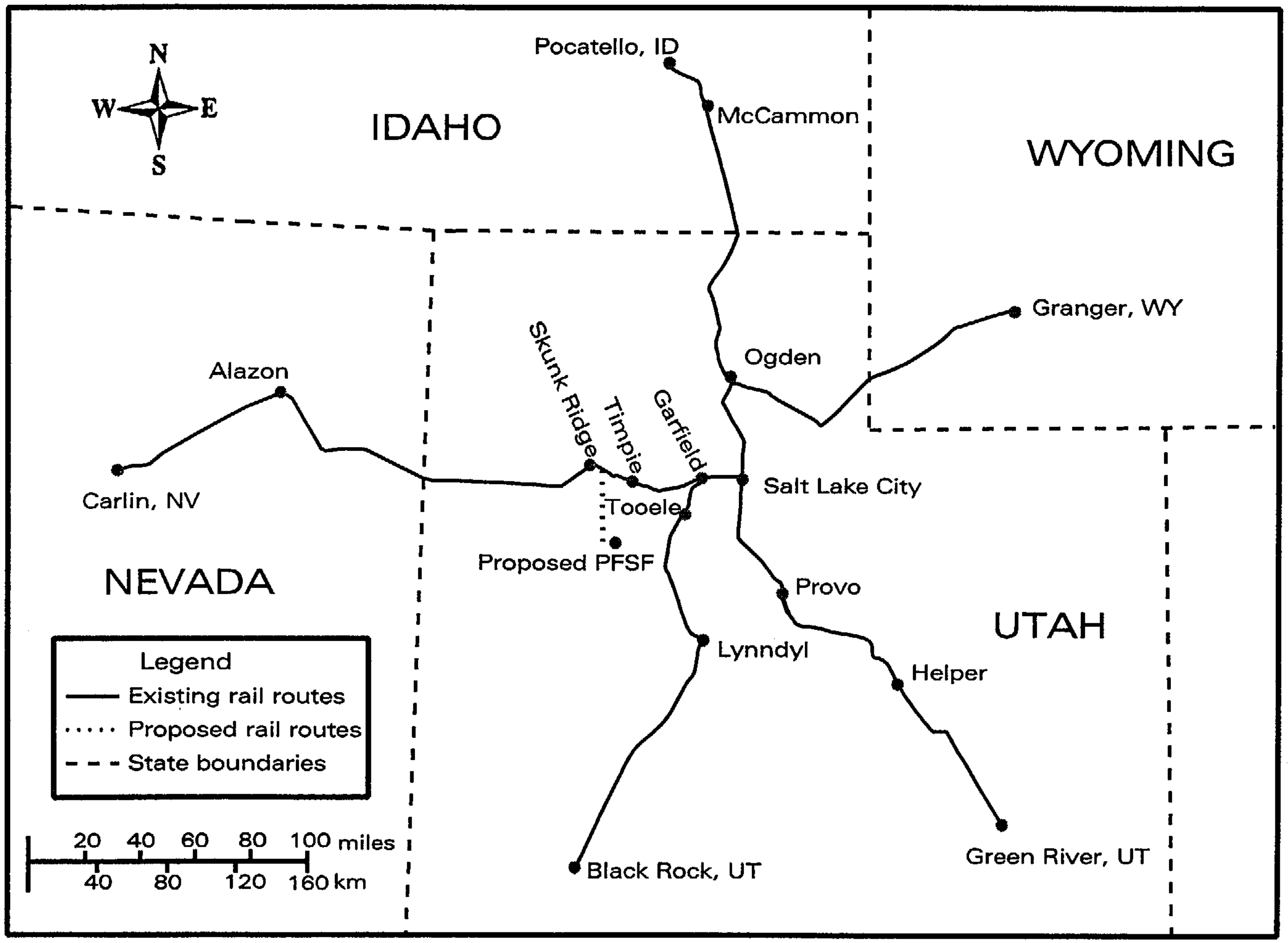


Figure 2.7. Potential rail routes for shipping spent nuclear fuel to Skull Valley, Utah.

which would proceed from the originating reactor site directly to Skull Valley, Utah, stopping only for crew changes, refueling, and periodic inspections. If the proposed rail line to the facility is constructed, then on average, the proposed PFSF would receive one train each week carrying three or four loaded shipping casks per train; however, up to six loaded shipping casks per train could be accommodated by the proposed single-purpose trains.

Transport to the proposed PFSF from the main line of the Union Pacific rail system would be done by rail using the proposed Skunk Ridge rail line described in Section 2.1.1.3. A minimum of two fleets of three to six railcars each would be used under the rail option. Shipping casks would not be removed from the railcars when they reach the new Skunk Ridge siding. The railcars containing shipping casks would be moved by locomotives along the new rail line to the proposed PFSF. Generally, one to two such round-trips would be scheduled each week. Two personnel would be required to operate the locomotives and perform the necessary coupling and uncoupling operations at the new rail siding.

PFS would employ a "start-clean/stay-clean" philosophy, meaning that the proposed PFSF would be intended to be a radiological contamination-free site. Operating under the start-clean/stay-clean philosophy, PFS would require that once a railcar arrives at the PFSF site, the shipping cask, impact limiters, and shipping cradle would be visually inspected. Personnel would then transfer the shipping cask into a designated area for radiological monitoring. In the event contamination above acceptable levels were discovered, the canister would be returned to the shipper. After the receipt is complete, the shipping casks would be transferred into the Canister Transfer Building, where the shipping casks would be removed from their transport vehicles by crane (see Item No. 1 in Figure 2.8), turned to a vertical position, and moved into a transfer cell (see Item No. 2 in Figure 2.8). Inside the transfer cell, the shipping cask and the storage cask would sit side by side (see Figure 2.8). The top of the shipping cask would be unbolted, removed, and set aside. The crane would then pick up an open-bottomed, shielded transfer cask and move it into position over the shipping cask. The sealed SNF canister would be lifted out of its shipping cask into the transfer cask. The crane would be used to move the transfer cask (with the SNF canister inside) from the top of the shipping cask to the top of the storage cask (see Item No. 3 in Figure 2.8).

As shown in Figure 2.8, movement of the transfer cask (with the SNF canister inside) from a position above the shipping cask to above the storage cask would occur on the second floor of the Canister Transfer Building. The canister would never be lifted more than 25 cm (10 inches) above the second floor. Once the transfer cask is in position above the storage cask, the canister would then be lowered from the transfer cask into the storage cask (see Item No. 4 in Figure 2.8). A lid would be placed and bolted on top of the storage cask prior to moving the cask onto the storage pads (see Item No. 5 in Figure 2.8).

A specially designed storage cask transporter, equipped with a 180-metric-ton (200-ton) hydraulic lifting beam and rolling tracks (see Figure 2.9), would be used to move each storage cask from the Canister Transfer Building onto the storage pads. The shipping casks would be surveyed, decontaminated as necessary to comply with radiological regulatory limits, and returned to the Skunk Ridge rail siding. From there, the shipping casks would be returned to an originating utility for use in future SNF shipments.

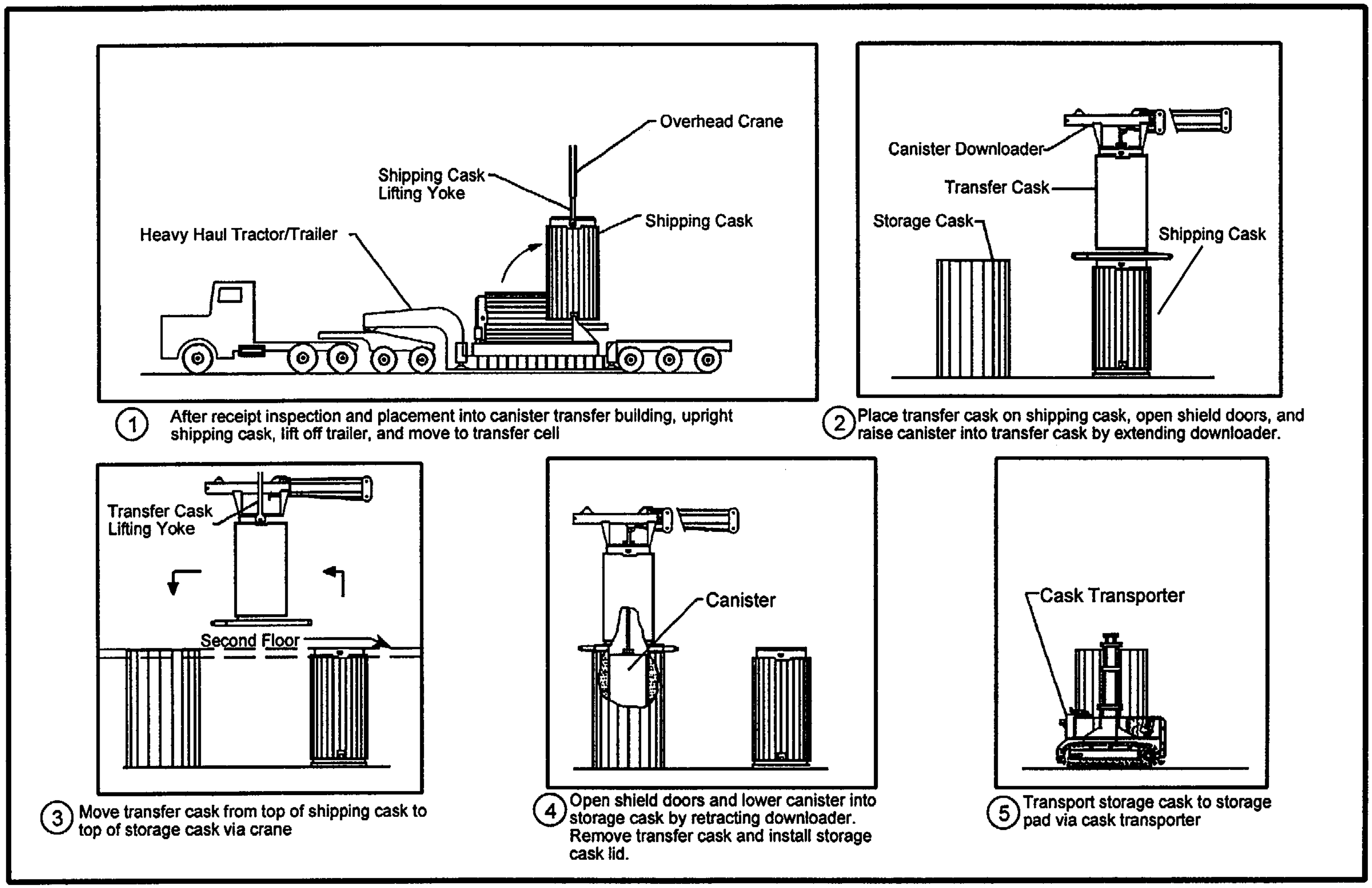


Figure 2.8. Transfer operations for spent nuclear fuel assemblies (inside sealed canisters) at the proposed PFSF.

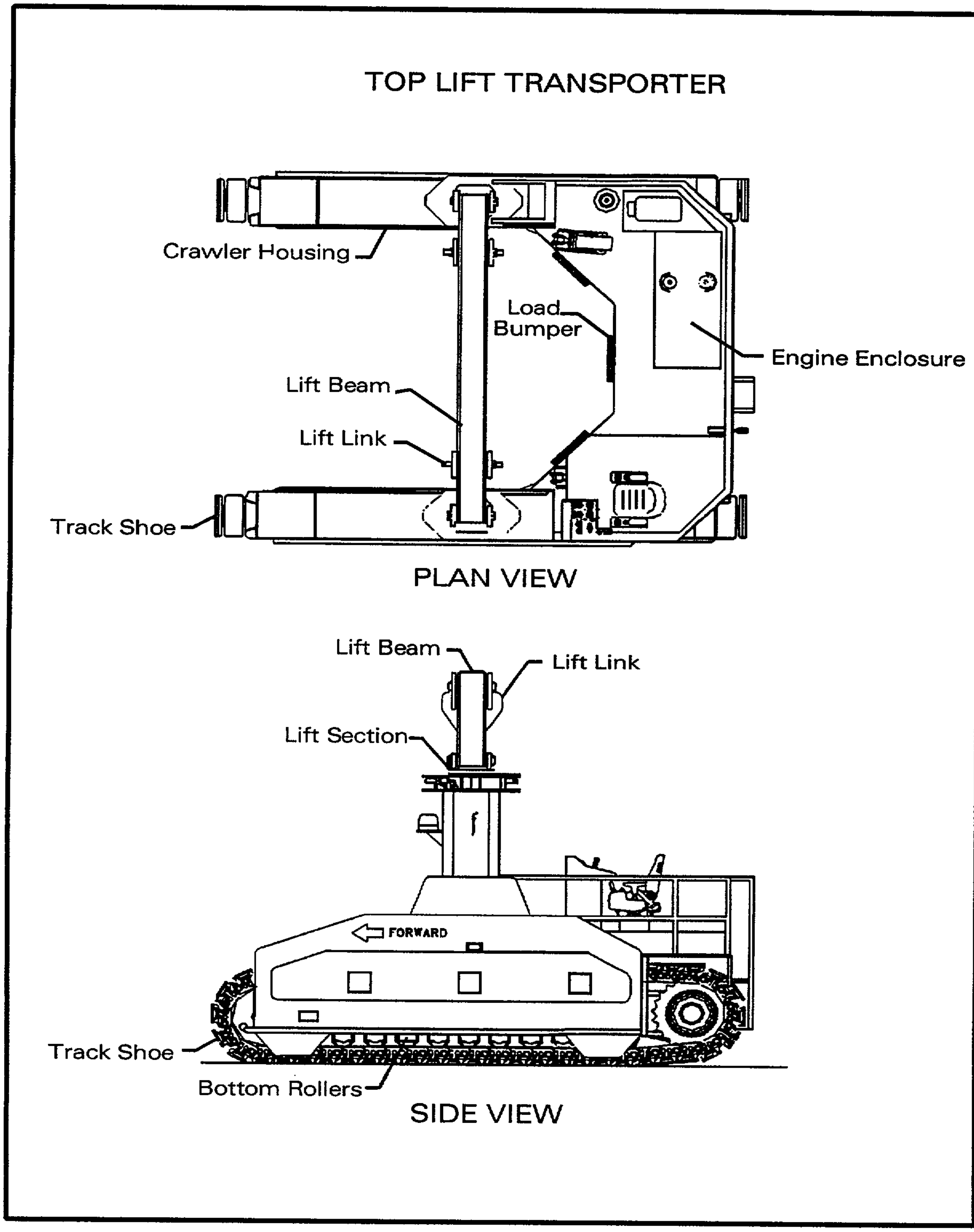


Figure 2.9. Type of storage cask transporter proposed for use at the PFSF.

CONTAINERS FOR SPENT NUCLEAR FUEL

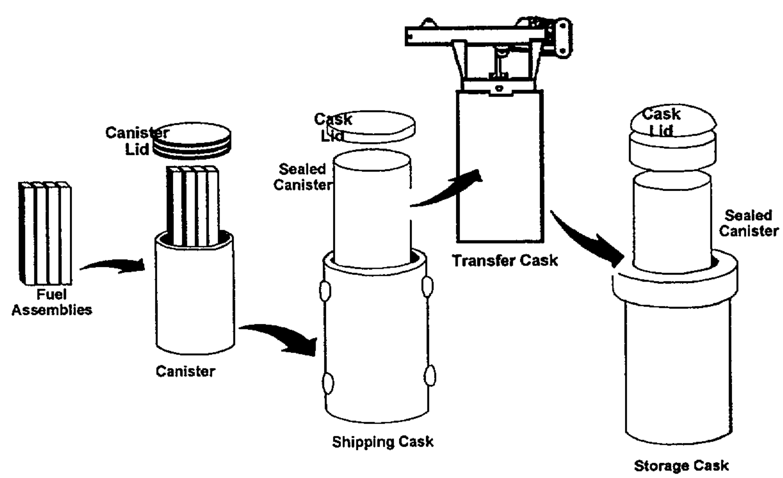
Several types of containers for spent nuclear reactor fuel are discussed in this DEIS. These include:

Canisters are thick-walled, steel cylinders used to package and contain SNF assemblies. Canisters are hermetically sealed by welding them shut. This DEIS discusses "dual-purpose canisters" that can be used for shipping and storing of SNF. That is, once the SNF is sealed into the dual-purpose canister, it would never need to be removed from the canister during interim storage.

Shipping Casks are thick-walled, steel cylindrical packages certified by the NRC to transport nuclear fuel.

Transfer Casks are radiation-shielded, open-bottomed cylinders used to transfer SNF assemblies from shipping casks into storage casks. All transfer operations would be conducted inside a special room, or "transfer cell," within a closed building. SNF assemblies would be lifted out of the shipping cask into the transfer cask, moved while inside the transfer cask to a position over the storage cask, and then lowered from the transfer cask into the storage cask.

Storage Casks are thick-walled, steel or steel and concrete containers certified by NRC for storing SNF. The types of storage casks discussed in this DEIS are vertical, cylindrical structures that provide radiological shielding. They are equipped with vents and channels that provide cooling by passive, natural convection processes; hence, they require very little maintenance other than periodic inspections. They are sometimes called "dry casks" because no cooling water is required.



2.1.2.2 Proposed Storage Cask System

The storage casks provide structural support for the canisters, physical protection, radiation shielding, and passive natural convection for cooling to remove decay heat while in storage. During storage, temperatures of the casks would be monitored, and periodic surveillance of the casks for vent blockage would be conducted on the basis of the requirements of the NRC license for the proposed PFSF.

PFS expects that its proposed dual-purpose canister system would be compatible with DOE's plans for placement in a permanent repository. When a DOE interim storage facility or permanent repository becomes available, the stored SNF would be moved from the storage pads in Skull Valley and transferred to shipping casks following the same transfer operations described above but in reverse order.

PFS intends to store SNF at the proposed PFSF for up to 40 years. Consistent with NRC's Waste Confidence Decision (see Section 1.3), by the end of that period, it is expected that a permanent repository would be available to receive the SNF from the proposed PFSF. The proposed PFSF would be designed to store up to 40,000 MTU of spent reactor fuel from U.S. commercial reactors. While at the proposed PFSF, the SNF would remain the property of the originating utility. The service to be provided by PFS under the terms of the proposed lease would be storage only, and all SNF would be removed from the proposed PFSF before decommissioning.

The cask system being considered for use at the proposed PFSF is the Holtec International HI-STORM system (see Figure 2.10). The cask supplier would be responsible for design and certification by NRC of the canisters, casks, and transfer equipment. The characteristics of the HI-STORM canister and storage cask are shown in Tables 2.5 and 2.6, respectively. More detailed descriptions of the specifications for the cask, canister, and canister transfer operations may be found in Chapters 4 and 5 of PFS's SAR (PFS/SAR 2000) and the NRC's SER (NRC/SER 2000).

Table 2.5. Characteristics of the HI-STORM canister

Parameter	Value
Outside diameter	1.7 m (5.7 ft)
Maximum length	4.8 m (15.9 ft)
Capacity	24 PWR[a] assemblies *or* 68 BWR[b] assemblies
Maximum heat load	20.88 kW for PWR canister 21.52 kW for BWR canister
Material of construction	Stainless steel
Maximum weight (loaded with SNF)	PWR: 36.3 MT (40.0 tons) BWR: 39.6 MT (43.6 tons)
Internal atmosphere	Helium

[a]PWR = Pressurized water reactor
[b]BWR = Boiling water reactor

Source: PFS/SAR 2000; Table 4.2-1

2.1.3 Emissions, Effluents, and Solid Wastes

Atmospheric emissions (e.g., dust and vehicle exhaust) would be generated by the soil-disturbing activities associated with site preparation and construction of the storage area, the access road, the new rail siding and the new rail line. However, few atmospheric emissions are anticipated during the

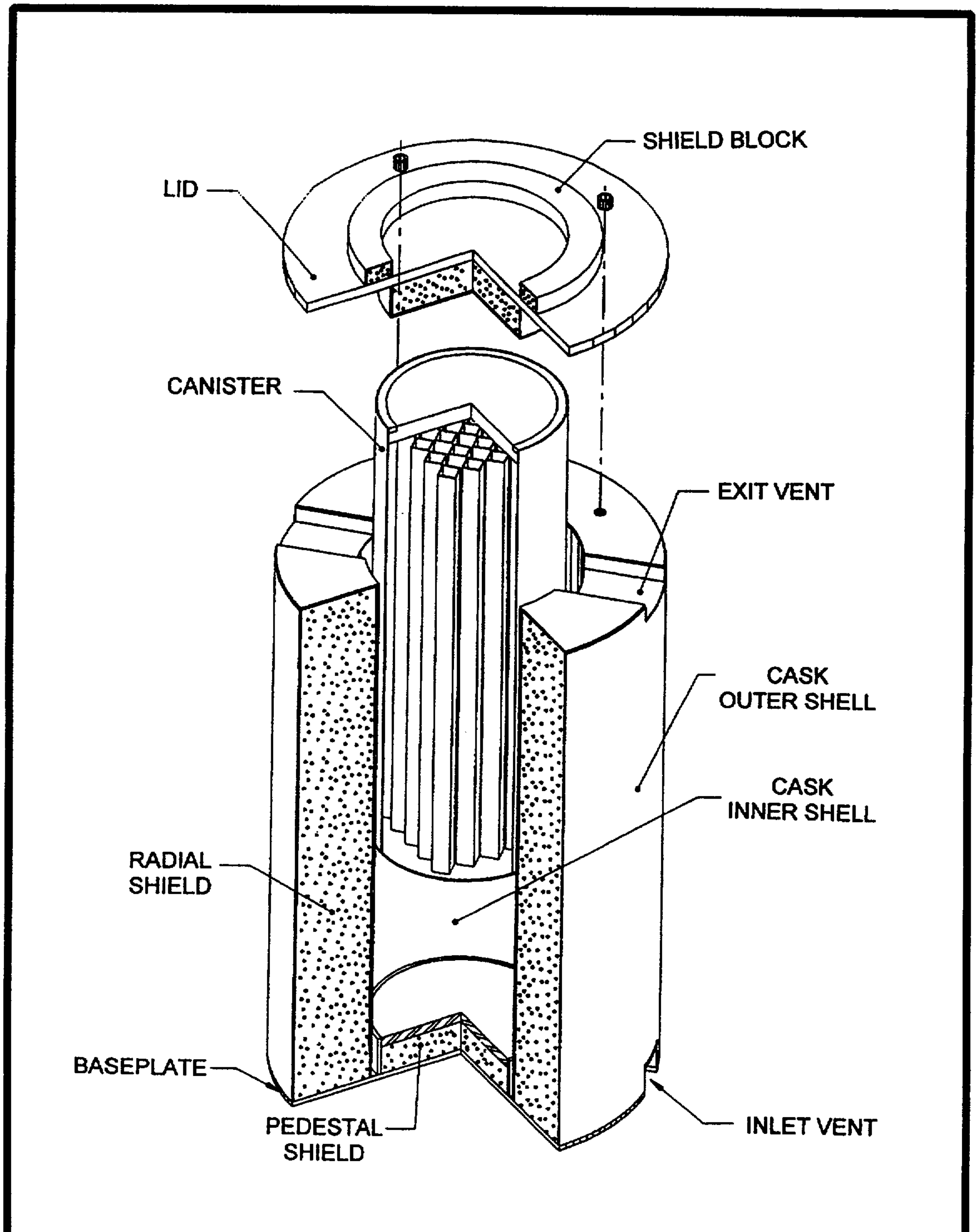


Figure 2.10. HOLTEC Hi-Storm® storage cask. Note: Air inlets and outlets would be covered by wire mesh.

Table 2.6. Characteristics of the HI-STORM storage cask system

Parameter	Value
Height	5.9 m (19.3 ft)
Outside diameter	3.4 m (11 ft)
Capacity	1 loaded canister
Maximum radiation dose	
1 m from surface:	
Side	17 mrem/hr
Top	2 mrem/hr
On contact with surface:	
Side	35 mrem/hr
Top	5 mrem/hr
Top vents	9 mrem/hr
Bottom vents	15 mrem/hr
Material of construction	Concrete (core and lid) Steel (liner and shell)
Maximum weight (loaded with single SNF canister)	PWR[a]: 158.0 MT (174.2 tons) BWR[b]: 161.3 MT (177.8 tons)

[a]PWR = Pressurized water reactor fuel assemblies inside canister.
[b]BWR = Boiling water reactor fuel assemblies inside canister.

Source: PFS/SAR 2000; Tables 4.2-2 and 4.2-5.

facility's operation. Those anticipated emissions would come from vehicles involved in transporting and transferring shipping casks, storage casks and liners, and personal cars for workers commuting to the facility. In addition, emissions would be released from the concrete batch plant, which would continue operations throughout the life of the proposed PFSF to provide concrete for the storage pads and storage casks.

The only liquid effluents that would be generated at the facility are stormwater runoff that would be directed to the detention basin and the natural drainage system, and domestic wastes that would be fed into the facility's septic system. Stormwater runoff is not expected to contain any radiological effluents since PFS intends to employ a start clean/stay clean philosophy. PFS has stated that it would employ "best management practices" (BMPs) to minimize atmospheric emissions and liquid effluents (see Section 2.1.4). PFS states that an important objective of the project is to employ a "start clean/stay clean" philosophy. The proposed PFSF is intended to be a zero-release facility. Nevertheless, solid dry low-level radioactive waste (e.g., smears, disposable clothing) could be generated while performing health physics surveys. These wastes would be collected, identified, packaged in low-level waste containers marked in accordance with the requirements of 10 CFR Part 20, and temporarily stored in the holding cell of the Canister Transfer Building while awaiting shipment to a licensed offsite low-level radioactive waste disposal facility. No other radioactive wastes are expected from the proposed facility.

Other solid wastes, such as office or paper trash and lunchroom wastes, would be collected and disposed of as garbage at an off-site commercial location.

2.1.4 Best Management Practices

Best management practices (BMPs) are defined in both Federal and state regulations. EPA's definition is contained in 40 CFR 122.2, which consists of regulations that address the management of practices that could create water pollution. This definition states:

> *Best Management Practices "(BMPs): mean schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.*

This definition is also used by the State of Utah in its Department of Environmental Quality's Stormwater General Permit for Construction Activity, Part VII. PFS has expanded the above definition and has committed to management practices that include additional pollution prevention measures. These management practices address the protection of surface waters, the preservation of existing air quality, and the prevention of erosion of the surface soils during construction of the proposed PFSF. The additional pollution prevention measures are listed in Table 2.7

Table 2.7. Best management practices as proposed by PFS during the construction of the PFSF

Construction activity	Minimum controls or BMPs to be implemented
PFSF Site	
Construction of the flood diversion berms	Drainage ditches will be stabilized and lined with rock aggregate/rip-rap to reduce flow velocity and prohibit scouring.
Containment of sediment-ladened stormwater runoff during grading and construction	A large stormwater infiltration basin will be constructed at the site during the initial phase of construction to collect the majority of runoff from the construction site. The basin will be designed to capture the 100-year storm event and will be equipped with a stilling basin and an emergency overflow constructed of stabilized non-erodible material. Any solids collected within the runoff entering the basin will settle out and the water will either evaporate or will provide groundwater recharge.
Dissipation of stormwater runoff routed around the facility boundary	Flow dissipaters will be installed at the discharge point of each diversion channel to further reduce the stormwater velocity and convert it to sheet flow. At a minimum, these devices will be constructed of rip-rap.
Stabilization of disturbed soils around the concrete storage pads	Disturbed soils around each concrete storage pad will be permanently stabilized with a layer of limestone aggregate.
Stabilization of disturbed soils around the four buildings proposed for the site	Silt fencing and sediment traps will be installed where appropriate. The construction roads will be periodically watered down to control fugitive dust emissions.

Table 2.7. Continued

Construction activity	Minimum controls or BMPs to be implemented
PFSF Access Road Construction	
Construction of the flood diversion berm	The flood diversion berm constructed perpendicular to the site access road will be stabilized and lined with rock aggregate/rip-rap to reduce flow velocity and prohibit scouring. If necessary, a stormwater flow dissipation device will also be placed at the diversion berm discharge point.
Grading and construction	Silt fencing and sediment traps will be installed where appropriate. The construction road will be periodically watered down to control fugitive dust emissions. Stone construction pads will be placed at the entrance/exit point-of-access roads to avoid excessive tracking of dirt and sediment onto county or state highways. Where appropriate, external vehicle washing (without the use of detergents) will be performed on-site, if it becomes necessary.
Fugitive dust controls	Construction road watering trucks will be used to periodically wet active construction road surfaces, stone construction entrance pads will be placed at construction road egress points to avoid excessive sediment tracking onto county or state roadways.
Drainage way construction	Box culverts will be placed at select locations under the access road entering the site. Rip-rap or other flow dissipation devices will be placed at the discharge points of each culvert and silt fencing and/or sediment traps will be employed were appropriate.
Rail Access Corridor from Skunk Ridge	
Grading and construction	Silt fences and sediment traps will be installed where appropriate. Disturbed soils will be limited to the extent practicable. Soils immediately around the rail line will be stabilized with crushed aggregate.
Stabilization of soil stockpiles associated with cut-and-fill operations	Soil stockpiles generated during the construction of the rail corridor will be placed in a manner to reduce erosion, and down-gradient areas will be protected by silt fencing. Temporary seeding or additional temporary soil stabilization measures will be applied, if necessary.
Arroyo crossings	Culverts will be placed in drainage ways and will be designed for a 100-year storm. In addition, the discharge points will be provided with stone aggregate or other flow dissipation devices to reduce stormwater velocity and minimize erosion. Sideslope soil stabilization devices, including silt fencing and aggregate, will be used where appropriate.
Universal Housekeeping BMPs	
All	Construction equipment maintenance and repair will be designated and controlled to prevent the discharge of oils, grease, hydraulic fluids, etc.
All	Waste receptacles and/or trash dumpsters will be placed at convenient locations for the regular collection of waste. Where practicable, materials suitable for recycling will be collected.
All	If external washing of construction vehicles is necessary, no detergents will be used, and the runoff will be captured in a sediment trap.
All	Adequately maintained sanitary facilities will be provided for all construction crews.

2.1.5 Monitoring Programs

PFS would establish a pre-operational radiological environmental baseline to characterize the existing background levels of radiation. The baseline would include sampling for radioactivity in soil, groundwater, vegetation, and the flesh of non-migrating animals near the proposed PFSF site. An on-going monitoring program is not necessary since the operating storage facility has no effluents that could carry radioactivity into the environment.

Airborne monitoring (by continuous radiation air monitors) would be performed by PFS inside the Canister Transfer Building during SNF handling operations. The building would also use area radiation monitors for recording the general building doses during canister transfer operations.

Workers at the facility would be monitored and their accumulated dose would be administratively controlled to maintain such doses within NRC regulatory limits. Monitoring of off-site individuals is not planned; however, radiation monitors [i.e., thermoluminescent dosimeters (TLDs)] would be used along the boundaries of the restricted-access area and the OCA to record radiation dose. The primary purpose of the TLDs is to monitor the direct radiation emanating from the storage casks.

To minimize the likelihood that animals spend extensive periods of time near to the storage casks, PFS would implement monitoring and take other actions to deter animals from entering the restricted-access area. PFS would monitor for signs of any on-site wildlife activity and would take measures to prevent habitation. If birds are found to be perching and/or nesting around or on the casks, devices (such as cones or spikes) would be installed to deter such bird behavior. Small mammals and reptiles would also be kept from the area by using traps, if necessary to safely capture and remove the animals. The entire facility would be surveyed by workers. If any signs of wildlife habitation are found, actions would be taken immediately to remove the animals.

An on-site meteorological monitoring program has already been established by PFS. The intent of this program is to collect data for the characterization of the local meteorology and not for radiological dispersion calculations.

2.1.6 Facility Closure and Decommissioning

At the end of its useful life (or upon termination of the lease with the Skull Valley Band or the NRC license, whichever comes first), the proposed PFSF would be closed. As a condition of the lease with the Skull Valley Band and as required by NRC regulations, decommissioning of the proposed PFSF would be required prior to closure of the facility and termination of the NRC license. The objective of the radiological decommissioning would be to remove all radioactive materials having activities above the applicable NRC limits in order for the site to be released for unrestricted use. The NRC license would also contain requirements and provisions for assurance from PFS that sufficient funds would be available at the end of the project's life to cover the costs of decommissioning activities. A "decommissioning fund" would be established by PFS in conjunction with the "per item" costs for receiving and storing each SNF canister. At the option of the Skull Valley Band, non-radiological decommissioning and restoration of the facility may include the removal of structures and reasonably returning the land to its original condition. All decommissioning activities must be completed within 90 days of the expiration of the lease.

A preliminary decommissioning plan is contained in Appendix B of the license application for the proposed PFSF. Because the exact nature of decommissioning cannot be predicted at this stage of the project, the information presented below represents the best available conceptual description of the activities envisioned for decommissioning of the proposed PFSF. A final Decommissioning Plan would include information on site preparation and organization; procedures and sequences for removal of systems and components; decontamination procedures; design, procurement, and testing of any specialized equipment; identification of outside contractors to be used; procedures for removal and disposal of any radioactive materials; and a schedule of activities. The final Decommissioning Plan must be submitted to the NRC for review and approval. This approval process would require its own environmental review under NEPA that would result in an environmental assessment or environmental impact statement as appropriate. 10 CFR 72.54(g)(1) to (6) delineates the requirements for the final Decommissioning Plan.

The principal activities involved in decommissioning would include: (1) removal of all SNF from Skull Valley, (2) the removal or disposition of all storage casks, (3) the removal or disposition of the storage pads and crushed rock, and (4) the removal of the buildings and other improvements or their transfer to the Skull Valley Band. These activities are described in detail in the following paragraphs.

The storage casks would contain the SNF inside sealed metal canisters (see Section 2.1.2.2) that would be transferred into licensed shipping casks for transportation away from Skull Valley. The fuel assemblies would remain inside these sealed canisters such that decontamination of the canisters would not be expected to be necessary. Decommissioning activities would then be limited to radiological surveys and any necessary decontamination of storage casks, storage pads, or building structures. It is not anticipated that the storage casks or pads would have residual radioactive contamination because (a) the SNF canisters would remain sealed while in Skull Valley, (b) the canisters would be radiologically surveyed at the originating reactor and again once they arrive at the proposed Skull Valley facility to ensure that there is no radiological contamination, and (c) the neutron flux levels generated by the SNF would be sufficiently low that activation of the storage casks and pads produce negligibly small levels of radioactivity, if any.

2.1.6.1 Storage Cask Decommissioning

Following the removal of the canisters containing SNF, the empty storage casks would be surveyed to determine their levels of residual radioactivity. If the contamination levels were found to be below the applicable NRC limits for unrestricted release, then the empty storage casks would be disposed of as non-controlled material. Any contaminated storage casks would be decontaminated to levels below applicable NRC limits for unrestricted use. The fate of these items would be identified as part of the final Decommissioning Plan.

Any empty storage casks with contamination or activation levels above applicable NRC limits for unrestricted release would be dismantled, and the contaminated or activated portions would be segregated and disposed of off the Reservation at a low-level waste facility. The portions or components of any such storage cask which are below the applicable NRC limits for unrestricted release would be disposed of as non-controlled material.

Storage cask decontamination and decommissioning could be performed at any time following the removal of the SNF canister; thus, storage cask decommissioning efforts would essentially be complete by the end of operations to ship the canisters off-site. The shipping casks and transfer casks (see Section 2.1.2.2) would be similarly decommissioned after they are no longer required for facility operations.

2.1.6.2 Storage Pad Decommissioning

A major portion of decommissioning would involve the disposition of the storage pads. There would be a maximum of 500 storage pads, each having a surface area of 19.5 by 9.1 m (64 by 30 ft) and a depth of 0.9 m (3 ft). PFS has identified two alternatives for decommissioning the storage pads for unrestricted use: (1) the storage pads could be left in place, and the storage area could be covered with topsoil and replanted or (2) they could be excavated, cut into smaller sections, and trucked off-site for disposal (PFS/ER 2000). The decision to leave or remove the storage pads will be made by the Skull Valley Band and the BIA prior to decommissioning.

In accordance with the "start-clean/stay-clean" philosophy for the proposed PFSF, the concrete storage pads are not anticipated to become radioactively activated or contaminated. However, for the purpose of assessing the impact of any decommissioning activities, PFS assumed in its application that up to 10 percent of the storage pad area would require surface decontamination. The maximum total surface of 500 pads would be 89,200 m^2 (960,000 ft^2). The assumed decontamination of 10 percent of this area [i.e., 8,920 m^2 (96,000 ft^2) to be decontaminated] would produce about 8.2 m^3 (290 ft^3) of low-level waste. This contaminated material would be collected, packaged, and disposed of off the Reservation at a low-level waste facility.

In the event that the storage pads are removed in their entirety, approximately 81,600 m^3 (106,700 yd^3) of material would need to be removed and disposed of. The estimated number of truckloads [with each truck hauling 15 m^3 (20 yd^3)] needed to remove this material would be about 6,000, when a factor of 0.9 is included to account for void spaces among the pieces of sectioned pads.

2.1.6.3 Decommissioning of Buildings, Structures, and Other Improvements

The future of the buildings and other improvements to be constructed by PFS on the Reservation is to be determined by the Skull Valley Band the BIA. PFS is obligated to remove the buildings and other improvements at the request of the Skull Valley Band. PFS is collecting sufficient advanced funding to accomplish any or all of the building removals. If the Band chooses to retain any or all of the buildings and other improvements once the radiological decommissioning is completed, they have the right to receive a transfer from PFS in an "intact" condition. The future use of any buildings and other improvements not removed by PFS would be at the discretion of the Band, and any impacts associated with such use is beyond the scope of this DEIS.

The fences and peripheral structures are not expected to become contaminated. Therefore, it is expected that they would not require decontamination or special handling and would be removed or left in place as determined by the Skull Valley Band.

Upon expiration of the right-of-way, the rail line would be removed and reclaimed in accordance with the Plan of Development and right-of-way grant from the BLM. This plan calls for the rail and ballast to be removed and the remainder of the grade to be recontoured and reseeded. PFS would also need to file an application for abandonment authority with the STB. STB would review the proposed abandonment and conduct an environmental review under NEPA.

If for any reason during the term of BLM's right-of-way grant, the right-of-way is no longer needed for the purpose for which it was issued, BLM retains the right to require implementation of the reclamation plan. The BLM may also consider the assignment of the right-of-way to another qualified entity. Another consideration may be to reduce the level of reclamation to allow an alternative use such as converting rails to trails. If the rail line is still needed after the initiation term of the right-of-way grant, PFS may apply for renewal under the terms and conditions imposed by BLM.

2.2 Alternatives

This section examines the alternatives considered for the proposed action described in Section 2.1. The range of alternatives was determined by considering the underlying need and purpose for the proposed action. From this analysis, a set of reasonable alternatives was developed and the impacts of the proposed action were compared with the impacts that would result if a given alternative was implemented (see the comparative summary of impacts in Chapter 9).

The range of alternatives addressed in this DEIS is based upon PFS's needs (as described in Section 1.3) and upon the Skull Valley Band's need for economic development (see Section 1.5.2). These alternatives cover (a) the facility, (b) the alternative technologies available for an operational ISFSI, (c) the alternative locations for an ISFSI, (d) the transportation options for moving SNF to the site of the proposed PFSF in Skull Valley, and (e) a "no-action" alternative under which the proposed PFSF would not be built. Sections 2.2.1 through 2.2.5, respectively, discuss these alternatives in detail.

2.2.1 Alternatives to the Proposed PFSF (Not Addressed Further in this DEIS)

The proposed PFSF is intended to satisfy the need for an interim facility that would provide a safe, efficient, and economical alternative to continued SNF storage at reactor sites (see Section 1.3). Other than at-reactor storage (in SNF pools or dry casks) no other SNF storage alternatives currently exist for most utilities. Alternatives to the proposed PFSF include (1) a different privately owned away-from-reactor ISFSI, (2) shipment of SNF from reactors sites without sufficient storage space to reactor sites with additional SNF storage capacity, and (3) alternatives that, in effect, eliminate the need for the proposed PFSF. Each of these three alternatives is discussed below.

2.2.1.1 A Different Privately Owned ISFSI

Any away-from reactor ISFSI would be required to meet the requirements in 10 CFR Part 72. Other than the proposed PFSF, no other commercially owned away-from-reactor dry cask storage system ISFSIs are available or have been proposed. Therefore, no evaluation of an alternative ISFSI has been included in this DEIS.

2.2.1.2 Shipment of SNF Between Reactor Sites

This alternative would require, in most cases, that a utility agree to receive another utility's SNF. To date, NRC has issued licenses to only two utilities to transfer SNF from one reactor site to another for storage of SNF. In both cases, the receiving and shipping reactor sites were owned by the same utility. No utilities have requested approval from NRC to accept SNF from a reactor site owned by another utility, and no proposals for such requests have been identified to date. NRC approval would be needed before a reactor site could store SNF from another site. In most cases, a license amendment would be required, and the license amendment process would include a NEPA review. It is unlikely that this alternative would provide sufficient capacity to satisfy the interim SNF storage needs for the PFS members or the industry.

The environmental impacts of this alternative would depend upon site-specific considerations related to any particular proposed transfer, and the particular transportation impacts that might result. Without identifying specific reactor sites that might be involved in this alternative, the discussion of cross-country transportation impacts in Section 5.7 provides a reasonable discussion of the potential transportation impacts. For the reasons discussed above, this alternative was not evaluated in detail in this DEIS.

2.2.1.3 Alternatives That, In Effect, Eliminate the Need for the Proposed PFSF

The need for the facility could be eliminated by the Federal Government taking possession and title to the SNF in a manner that would allow sufficient on-site storage to be maintained so that plant operations could continue and so that decommissioning could be completed for reactors that have already been shutdown.

During a Congressional hearing with the Subcommittee on Energy and Power in 1999, the Secretary of Energy presented a proposal that would have the Federal Government take title to utilities' SNF at reactor sites until a repository is opened. The Secretary of Energy stated that "the Department is only at the beginning of the process of analyzing this approach and discussing it with the utility industry and other parties." The proposal, as presented to date, would be very similar from an environmental standpoint to the no action alternative (see Section 2.2.5), in that the SNF would remain at the reactor site. However, the Secretary also stated that " we would still have to address a range of issues, including liability, financial and operational responsibilities." With such critical issues still being considered, the Secretary's proposal is not considered to be ripe for evaluation as an alternative to the proposed action in Skull Valley; hence, no such evaluation has been made in this DEIS.

2.2.2 Alternative Technology

2.2.2.1 Dry Storage Systems

PFS identified five types of SNF dry storage systems for use at the proposed PFSF, which are (1) single-purpose cask systems, (2) single-purpose canister systems, (3) dual-purpose cask systems, (4) dual-purpose canister systems, and (5) modular vault dry storage systems (PFS/ER 2000). PFS indicated that it selected the dual-purpose canister system described in Section 2.1 for the following reasons. First, it eliminates the need to handle or expose individual SNF assemblies during transfer once a canister is loaded and sealed at the originating power reactor, and second, the use of the proposed dual-purpose canisters system, with separate transportation and storage overpacks (i.e., casks) for the canister, costs less than a dual-purpose cask system with a single cask for both transportation and storage, because every storage cask does not need to be licensed and built to the standards of the 10 CFR Part 71 transportation requirements.

The other dry storage systems would be constructed of materials similar to those used for the proposed system. The other dry storage systems would be required to meet the standards set forth in 10 CFR Part 72, and the environmental impacts would not be significantly different from those associated with the proposed system. Accordingly, this DEIS does not include a detail evaluation of other current dry storage system design.

2.2.2.2 Wet Storage Systems

NRC considers both wet and dry storage of SNF storage to be safe. The regulations in 10 CFR Part 72 govern the design and operation of wet and dry SNF storage systems. A wet ISFSI would require packaging of the fuel at the reactor site for shipment, unpackaging of the SNF at the ISFSI site, and placement of the SNF into a storage pool. Currently, DOE plans to employ dry cask storage technology at a permanent repository; therefore, it would be necessary for SNF stored at a wet ISFSI to be packaged again prior to shipment to a permanent repository. In addition, a wet ISFSI would require more operational, maintenance, and surveillance activities to maintain its safety than a dry-cask storage system, which relies on passive features to maintain cooling and radiation shielding. The additional packaging of the SNF, operational, maintenance, and surveillance activities would result in a loss of efficiency and increased costs. A wet ISFSI also would involve additional handling of the fuel which would likely lead to higher radiation exposure for workers, as well as an increase in the risk for a fuel-handling accident. For these reasons, alternatives that employ wet storage technologies have not been evaluated further in this DEIS.

2.2.3 Alternative Sites

PFS undertook a site selection process in 1996 to identify viable locations for the proposed ISFSI. The site selection process and criteria used by PFS are described in Chapter 7 and in Appendix F. Through its site selection process, PFS identified the Reservation as its preferred site. Once the preferred site was identified, a preferred location was selected (i.e., Site A) for the PFSF. In addition, PFS identified an alternative location on the Reservation (i.e., Site B). PFS also identified a site in Fremont County, Wyoming, as an alternative, secondary site (see Section 2.2.3.3); however, PFS has elected to pursue the leasing and development of the Skull Valley site. The license application that is the subject of this DEIS specifically applies only to the Skull Valley site; however, NRC compares the proposed site to alternative sites to determine if such an alternative site is an obviously superior alternative to the proposed PFSF site. The Wyoming location is evaluated in Chapter 7 of this DEIS as an alternative to the site proposed in PFS's license application.

2.2.3.1 Site A at the Reservation

The PFS site-selection process resulted in the identification of a primary and an alternative ISFSI site for consideration on the Reservation. The Skull Valley Band determined the candidate site area on the Reservation. The offered land on the Reservation encompassed sections in the northwest corner of the Reservation (see Figure 2.1 and the discussion in Section 2.1.1 of this DEIS). Two potential locations, Site A and Site B, were identified by PFS on the Reservation within the area proposed (i.e., within Sections 6 and 7 of T5S/R8W) by the Skull Valley Band. These potential sites were evaluated and a final site (i.e., Site A) was selected. Only minor differences existed between the two sites. The proposed site (Site A) was selected over the alternative site because of its greater distance to the nearest resident [3.2 km (2.0 miles) to the east-southeast].

2.2.3.2 Site B at the Reservation

As shown in Figure 2.11, Site B in Skull Valley is located about 800 m (0.5 mile) south of the proposed site (Site A), 1.6 km (1 mile) north of the Hickman Knolls outcropping, and 4.5 km (2.8 miles) north of the inactive Tekoi Rocket Motor Test facility. Approximately one-half of Site B is in Section 6 of T5S/R8W,with the other half in Section 7 of T5S/R8W. The nearest resident to Site B is approximately 3.1 km (1.9 miles) to the east. Selection of Site B in any Record of Decision would require the Skull Valley Band and PFS to amend the proposed lease (which currently applies only to Site A.)

2.2.3.3 Fremont County, Wyoming, Site

The alternative site in Wyoming (see Figure 2.12) is located north of Shoshoni, Wyoming, about 39 km (24 miles) northeast of Riverton and about 16 km (10 miles) southeast of the Owl Creek Mountains. It is also about 9 km (6 miles) east of the Wind River Indian Reservation. The site is described and analyzed in greater detail in Chapter 7.

2.2.4 Transportation Options

2.2.4.1 National Transportation Options

The PFSF is designed to employ dual purpose canister based storage systems. Because of the size and weight of the licensed shipping casks included in the PFS application, shipment by rail is the practicable cross-country transportation option for the SNF to be delivered to Skull Valley. While movement of SNF casks of this size is sometimes accomplished by specialized, heavy-haul truck and trailers, this is usually done only over short distances. Heavy-haul trucks and trailers typically travel at speeds of 10–20 mph, thus making them impractical for transporting SNF cross-county. Accordingly, truck transportation is not considered a viable option for cross-country transportation to the proposed PFSF and is not analyzed in detail. If PFS decides to use a dual purpose canister based cask system different from that included in its license request, including a design that can be transported by truck, PFS would be required to amend its license. The license amendment would require a NEPA review that would evaluate the impacts of cross-country truck transportation.

2.2.4.2 Local Transportation Options (in Skull Valley)

In this DEIS, the phrase "local transportation options" refers to the alternatives for moving SNF from the existing Union Pacific main rail line to the proposed PFSF on the Reservation. PFS has submitted two applications to the BLM: one as their proposed action and the other as an alternative proposal. The proposed action, as described in Section 2.1.1.3, involves the construction of a new rail line from Skunk Ridge. PFS's alternative proposal is construction of a new ITF and the use of heavy-haul tractor/trailers via the existing Skull Valley Road. Since BLM would approve only one of these right-of-way applications, or would deny them both, these two local transportation options are considered separately in this DEIS.

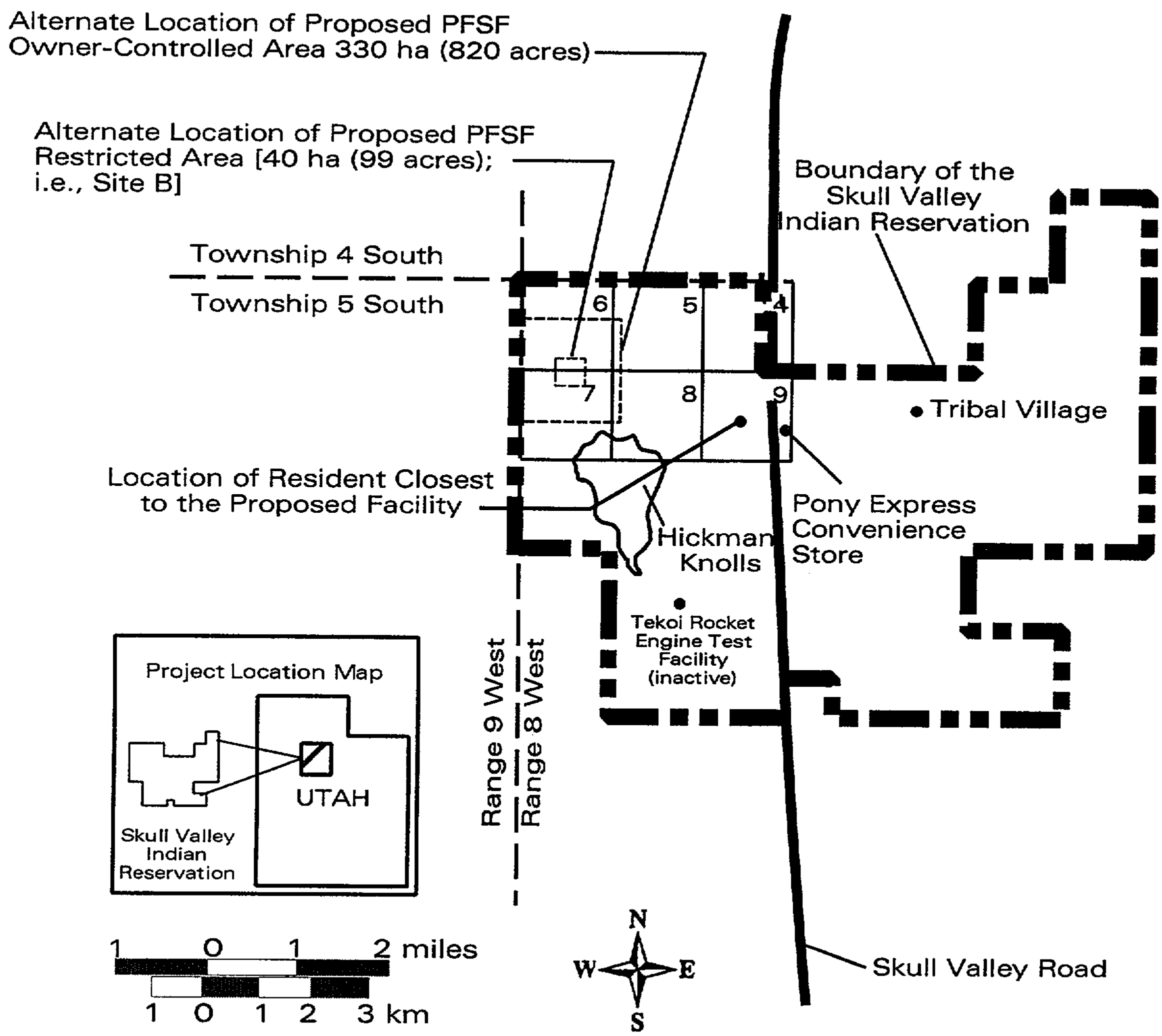


Figure 2.11. Alternative site (i.e., Site B) for the proposed PFSF on the Reservation.

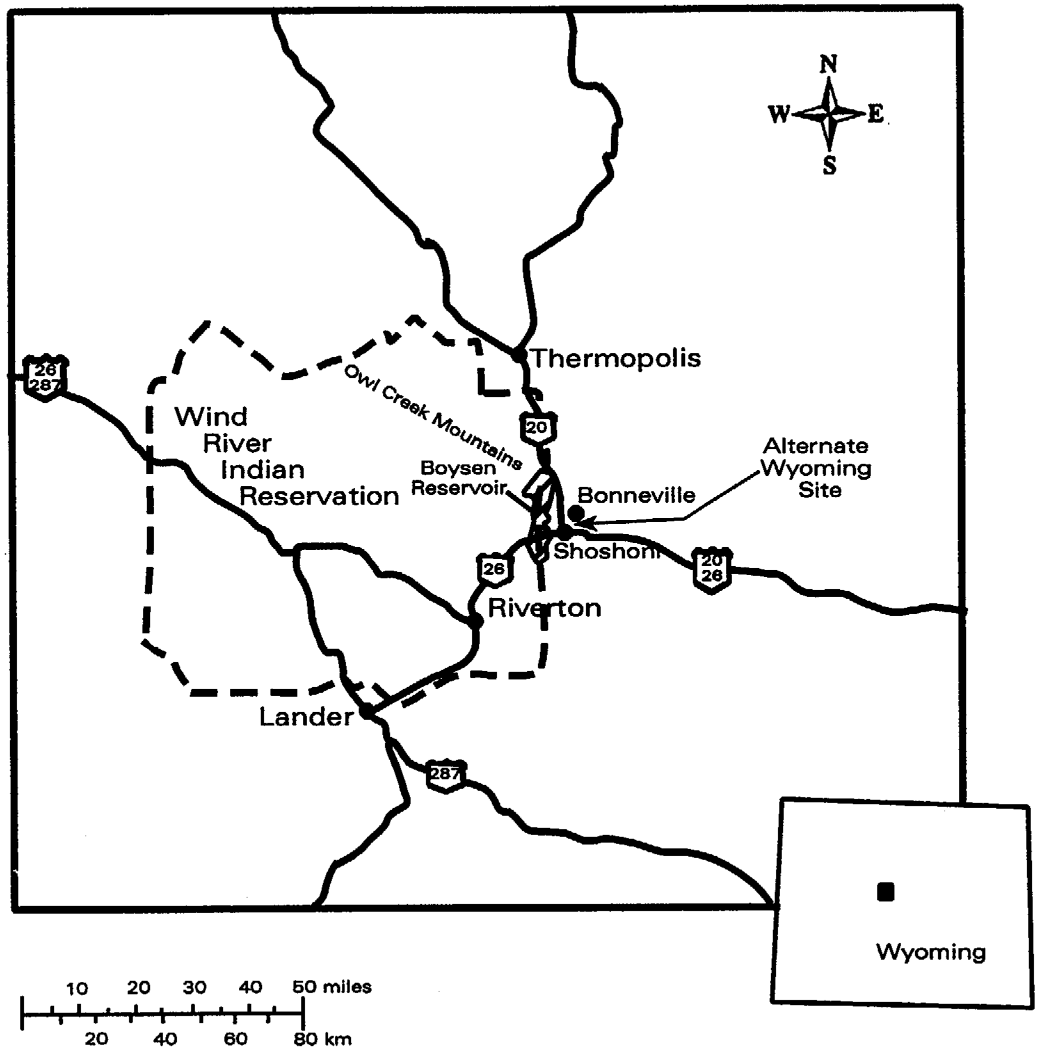


Figure 2.12. Location of an alternative ISFSI site in Fremont County, Wyoming.

Several other local transportation options were considered but eliminated from detailed analysis. Below is a summary of the ITF alternative evaluated in detail in this DEIS, as well as the other transportation alternatives considered but eliminated from further evaluation.

The ITF alternative. An alternative to the proposed new rail corridor through Skull Valley would be the use of an ITF, where SNF would be transferred from railcars to heavy-haul vehicles for transport to the proposed PFSF. PFS has filed a right-of-way application with BLM to construct and operate an ITF near Timpie, Utah. The ITF would be located approximately 2.9 km (1.8 miles) west of the intersection of Interstate 80 and the Skull Valley Road (see Figure 2.13), and approximately 39 km (24 miles) north of the site for the proposed PFSF. The existing Skull Valley Road would be used to transport the SNF from the ITF to the PFSF. The descriptions below are taken from PFS's Plan of Development for the proposed ITF (Hennessy 1999).

The right-of-way parcel lies between the existing Union Pacific rail line to the north and an existing frontage road to the south (see Figure 2.14). Construction of the ITF would be scheduled to begin upon issuance of the required approvals for the proposed PFSF and would be expected to last less than one year. The peak workforce would be 35 workers during the construction period.

The right-of-way parcel for the ITF would be approximately 300 m (1,000 ft) long and 100 m (350 ft) wide. The parcel would be connected to the existing frontage road by way of a new 9-m (30-ft) wide asphalt-paved road within a corridor of approximately 80 m by 30 m (270 ft by 100 ft). A new rail siding would also be constructed as part of the ITF. The total area of the ITF parcel is about 3.6 ha (9 acres). The total project area would be about 4.4 ha (11 acres), including 0.8 ha (2 acres) of land for the proposed new rail siding which would be located entirely on the existing Union Pacific right-of-way (see Figure 2.14).

Clearing of the ITF project area would involve the removal and disposal of vegetation within the right-of-way. Any woody vegetation would be shredded and scattered in place. Topsoil at the site would not be stockpiled, and the right-of-way would not be revegetated. All 4.4 ha (11 acres) have been previously disturbed, and they would remain disturbed for the life of the project if the ITF were constructed.

The ITF would be designed to transfer cargo from railcars onto heavy-haul tractor/trailers. As shown in Figure 2.14, the proposed ITF would include one pre-engineered metal building (i.e., the Transfer Building) to house a single-failure-proof, 150-ton gantry crane for transferring cargo from rail to truck, a short rail siding, and a road that would loop around the perimeter of the facility to provide maneuvering space for the heavy-haul tractor/trailer rigs. The loop road would connect to the proposed new access road, which in turn would connect to the existing frontage road. In addition to the new access road, gravel or paved areas would be needed to park and maneuver the heavy-haul tractor/trailer rigs and to provide parking for worker's vehicles.

The Transfer Building would be about 24 m (80 ft) wide, 60 m (200 ft) long, and 16.5 m (54 ft) high. Excavation would be required at the site for installation of the foundation supporting the crane and the building's framework. The facility would be immediately surrounded by a 2.4-m (8-ft) chain link fence to control public access, and it would be illuminated at night by sodium vapor yard lights. A range fence would enclose a buffer area around the entire facility (see Figure 2.14).

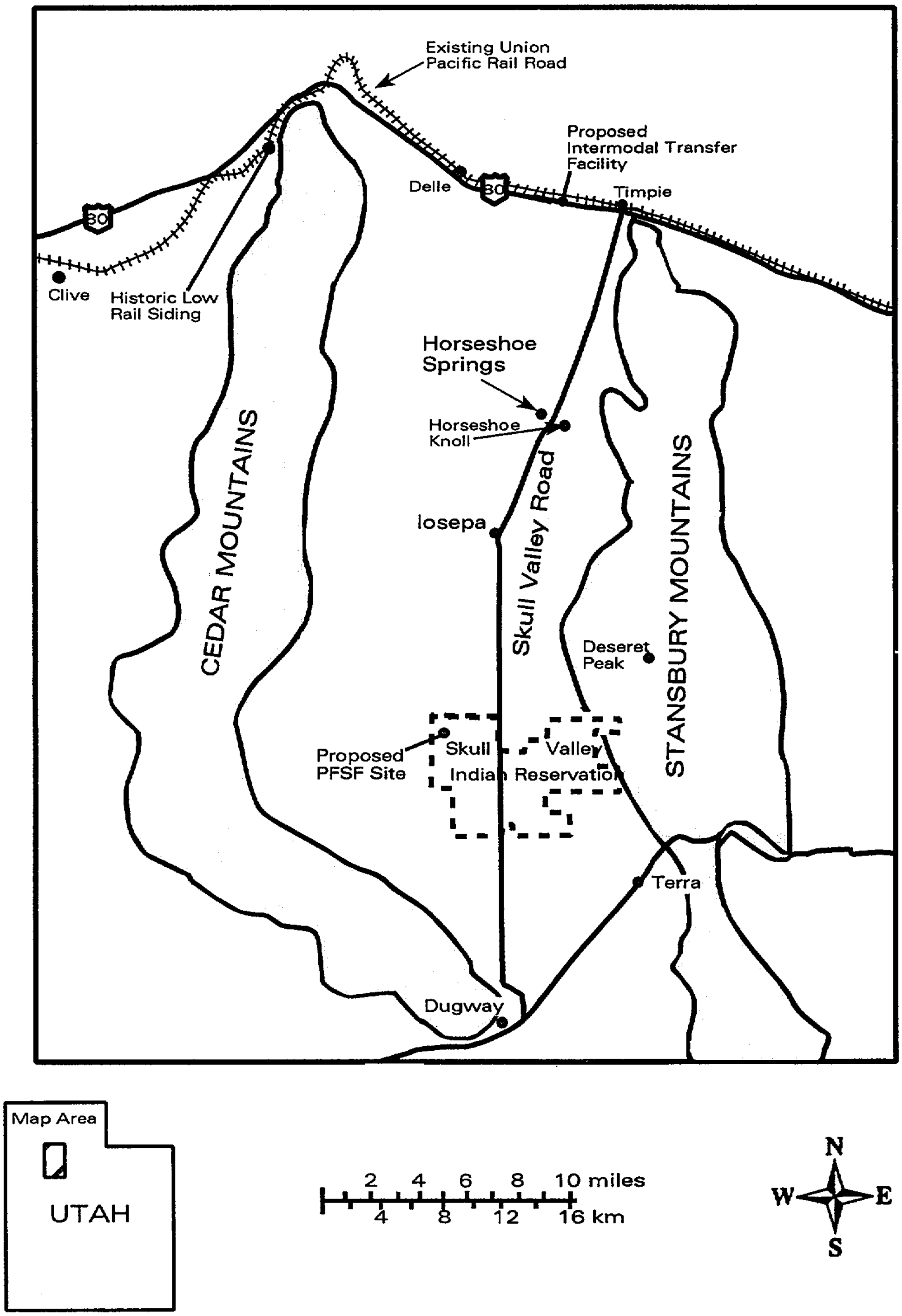


Figure 2.13. Proposed location of an Intermodal Transfer Facility in Skull Valley.

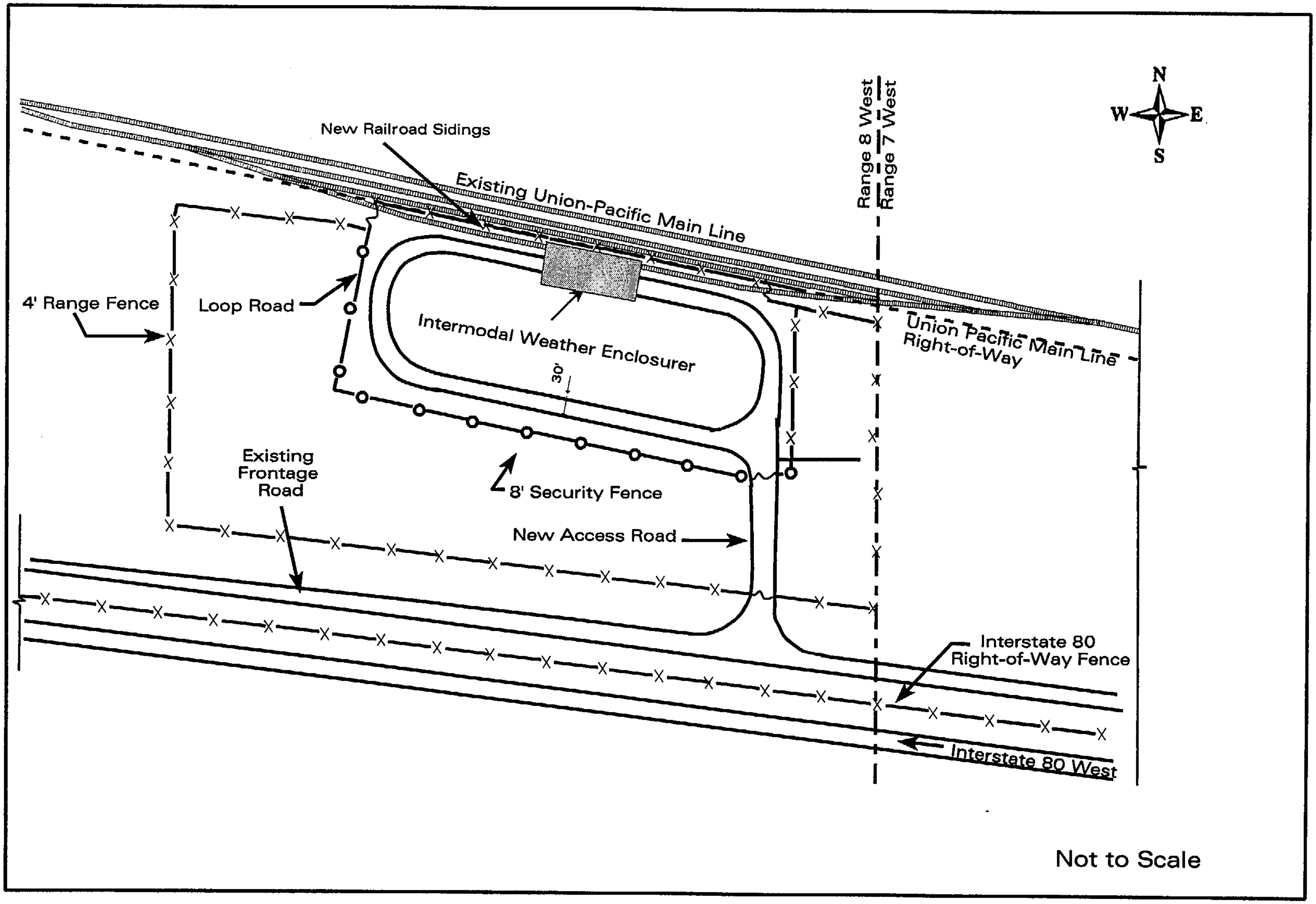


Figure 2.14. Basic site plan and layout for the Intermodal Transfer Facility.

Potable water would be provided for the ITF in tanks transported from the site. Sewage facilities would be provided by an on-site septic system and drain field.

The new rail siding for the proposed ITF would consist of three sections of sidetrack connected to the main line with switches and turnouts. The rail siding would be about 780 m (2,550 ft) long and would be located entirely upon the adjacent Union Pacific right-of-way. Approximately 4,100 m^3 (5,400 yd^3) of sub-ballast and 3,300 m^3 (4,300 yd^3) of ballast would be required. Table 2.8 provides a list of the materials that would be needed to construct the ITF.

Table 2.8. Materials to be imported and used in the construction of an intermodal transfer facility (ITF) near Timpie, Utah

Material type	Material Required
Concrete aggregate	
Small (sand)	880 m^3 (1,150 yd^3)
Large (crushed rock)	1,200 m^3 (1,600 yd^3)
Total concrete aggregate	2,080 m^3 (2,750 yd^3)
Crushed rock	
Access road base	2,800 m^3 (3,650 yd^3)
Building-area grading	16,000 m^3 (21,000 yd^3)
Total crushed rock	18,800 m^3 (24,650 yd^3)
Structural fill materials	2,000 m^3 (2,700 yd^3)
Sub-ballast	4,200 m^3 (5,450 yd^3)
Ballast	3,300 m^3 (4,300 yd^3)
Asphalt paving	2,000 m^3 (2,500 yd^3)

Source: PFS/ER 2000; Table 4.1-6

Construction of the ITF would require a peak daily water use of 132 m^3/day (35,000 gal/day), which would be primarily associated with dust control and soil compaction. This water would be provided by local commercial suppliers and would be transported to the site in tanker trucks.

If an ITF were constructed, then only three casks per train could be accommodated on shipments of SNF to Skull Valley from existing nuclear reactors. To achieve the maximum receipt rate of 200 casks per year, the ITF would be operated to receive two equivalent incoming trains per week carrying two casks per train (i.e., an average of four casks per week). A four-man crew would be expected to handle the transfer operations at the ITF.

The type of heavy-haul trailers proposed for use on Skull Valley Road range from 45 to 55 m (150 to 180 ft) in length and are typically 3.7 m (12 ft) wide (see Figure 2.15). These vehicles use dozens of

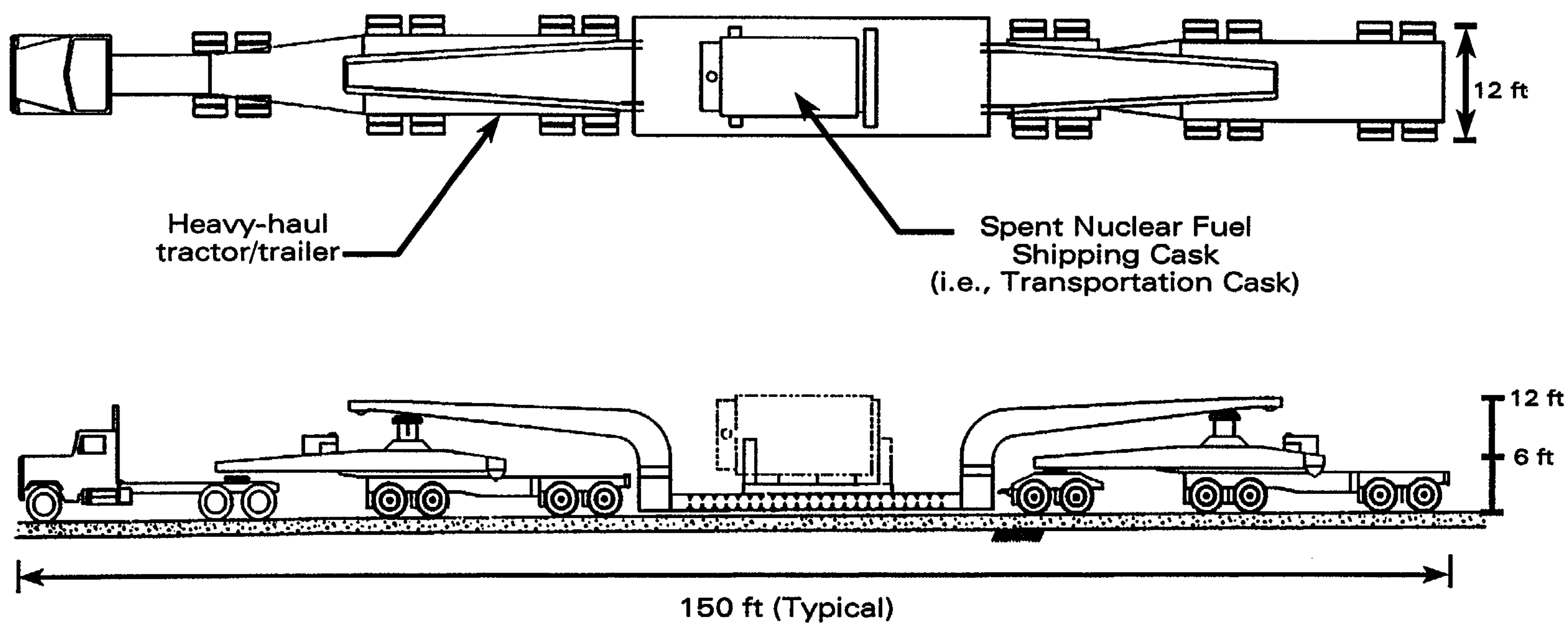


Figure 2.15. Typical heavy-haul tractor/trailer rig used for transporting spent nuclear fuel shipping casks.

tires to distribute the weight within typical highway load limits; nevertheless, the use of such trailers on Skull Valley Road would require a permit from the state of Utah due to their overall weight and length. No upgrades or improvements to the existing Skull Valley Road have been proposed by PFS for the transportation alternative involving a new ITF and the use of heavy-haul vehicles.

A minimum of two heavy-haul tractor/trailers would be used to move the SNF from the ITF to the proposed PFSF. The heavy-haul tractor/trailer would move at no more than 30 kph (20 mph) along Skull Valley Road. To transport the maximum of 200 shipping casks per year, two to four round-trips would be scheduled each week. The heavy-haul vehicles would be refueled from a self-contained diesel fuel filling tank located near the Operations and Maintenance Building at the proposed PFSF. This tank would be similar to the tank described in Section 2.1.1.2 for the cask transporter vehicles, except that its capacity would be 4.5 m^3 (1,200 gal). Once at the proposed PFSF, the shipping casks would be unloaded and handled the same as if they had been transported to the PFSF by the proposed Skunk Ridge rail corridor (see Section 2.1.2.1).

PFS has stated that the decommissioning and closure of the ITF would involve the dismantling and removal of the following structures: the rail siding, the pre-engineered metal building and its foundation, and the access road. The disturbed areas would be covered with topsoil and replanted with vegetation.

Local transportation options and alternatives considered but eliminated from detailed evaluation. Other local transportation schemes were considered but eliminated from detailed evaluation. These alternatives are discussed below.

Construction of a new rail line from a location other than Skunk Ridge. Construction of a new rail line from any location other than Skunk Ridge would involve the construction of a new siding to the north of Interstate 80, creating an unresolved problem in how to cross the interstate to reach the Reservation to the south. Construction of a new rail line on the eastern side of Skull Valley parallel to the Skull Valley Road was eliminated from analysis due to the likelihood for any such construction activity to directly impact wetlands at Horseshoe Springs (see Figure 1.3), existing houses and ranches, or traffic on Skull Valley Road. Thus, this alternative is not evaluated in this DEIS.

Another location considered was a rail line option that would use an existing rail line east of the Stansbury Mountains with a new corridor around the north end of these mountains (i.e., between the mountains and Interstate 80) and continuing south along Skull Valley Road. This option would result in similar construction impacts to the wetlands, houses, ranches, and traffic along Skull Valley Road, as well as substantial excavation at the north end of the Stansbury Mountains. Thus, this alternative is not evaluated in this DEIS.

Construction of an ITF and access road from Skunk Ridge or Delle, Utah. A new ITF, similar to the one described above, could be constructed at a location other than near Timpie. One possible location would be between Delle and Skunk Ridge. Construction of an ITF at such locations would result in increased disturbance of historic transportation features, including U.S. 40.

Construction of an ITF and an associated road at Skunk Ridge would have similar construction impacts to those for the proposed rail line, and would include the additional excavation for the ITF itself. The new access road would follow the proposed rail line corridor. An ITF at Skunk Ridge would be located closer to Interstate 80, creating a greater visual intrusion than for a new rail siding at Skunk Ridge (as proposed by PFS).

Delle was also considered as a potential location for an ITF. An existing siding at Delle could be expanded to meet PFS's needs, with space available for location of the ITF facilities. There is an existing Interstate-80 underpass at Delle that could allow access to the south. The proposed road route from Delle (see Figure 2.16) would connect with the proposed rail line corridor and would follow the proposed rail corridor to the PFSF. This alternative would eliminate the extensive excavation required at Skunk Ridge, but would require crossing short sections of the mud flats located south of Delle and Interstate 80. This alternative ITF and access route would occupy areas that are currently utilized by recreationists and motorists using Interstate 80.

Construction of a new ITF and an associated road from either Delle or Skunk Ridge would result in additional construction and maintenance impacts not associated with an ITF near Timpie, as well as operational impacts (such as additional radiological exposure from SNF handling) that would be avoided or reduced using transport on a new rail line through Skull Valley. Therefore, these alternatives were not evaluated in further detail in this DEIS.

2.2.5 No-Action Alternative

The no-action alternative would be not to build the proposed PFSF. Under the no-action alternative, there would be no lease with the Skull Valley Band, and the Skull Valley Band would be free to pursue alternative uses for the land in the northwest corner of the Reservation.

Under the no-action alternative, no right-of-way approvals would be granted by BLM and no amendments would be required for existing BLM Land Use Plans. The public lands administered by BLM at the proposed ITF near Timpie location, as well as at the proposed Skunk Ridge rail siding location and along the proposed Skunk Ridge rail corridor would be available for other uses compatible with existing land use plans. Under the no-action alternative, STB would not approve construction of the proposed rail line.

Under the no-action alternative, NRC would not approve the license application to construct and operate the proposed PFSF. Utilities would continue to store SNF at their reactor sites in facilities such as SNF pools and/or at-reactor dry cask ISFSIs until the SNF is shipped to a permanent geological repository.

In the absence of NRC license approval, there are several options that the PFS member or non-member utilities could pursue. At some reactor sites, utilities could expand the onsite storage capacity for SNF by constructing and operating at-reactor ISFSIs under a site-specific or general license, or, if possible, by expanding the capacity of their SNF pools. Some utilities have already initiated or completed such expansions under their existing licenses and would be unable to expand further. Under this option, all SNF would be stored at existing sites until such time as a permanent geological repository or DOE interim storage facility is available. For other sites where expansion of onsite storage cannot be accommodated either economically or because of physical constraints, utilities could propose developing a different ISFSI away from the reactor sites, or they would have to shut down before expiration of their operating license. In any event, under the no action alternative, SNF would continue to be stored at sites other than the proposed PFSF in Skull Valley, until such time as DOE provides a permanent geological repository.

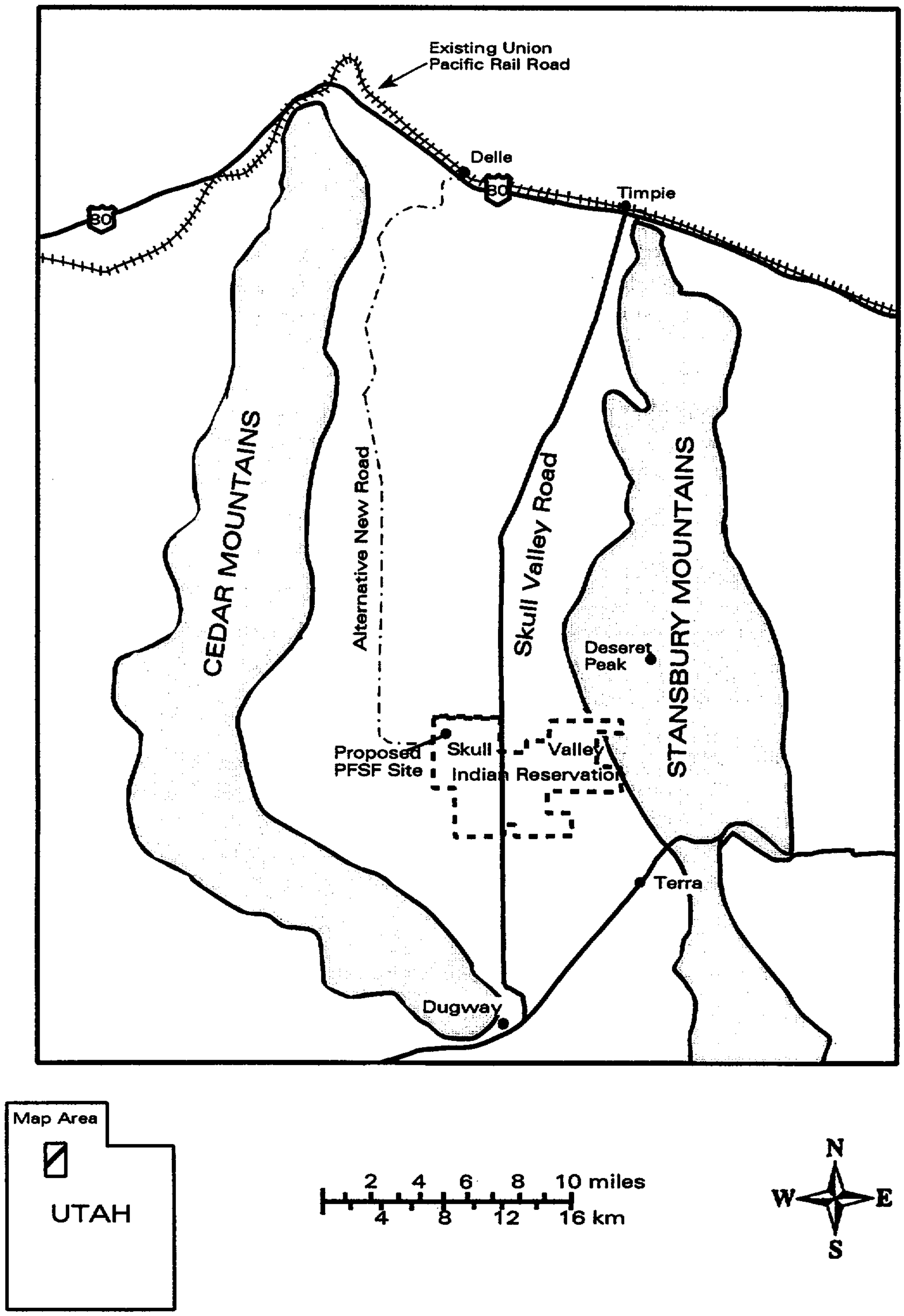


Figure 2.16. Alternative route for a new road in the western portion of Skull Valley.

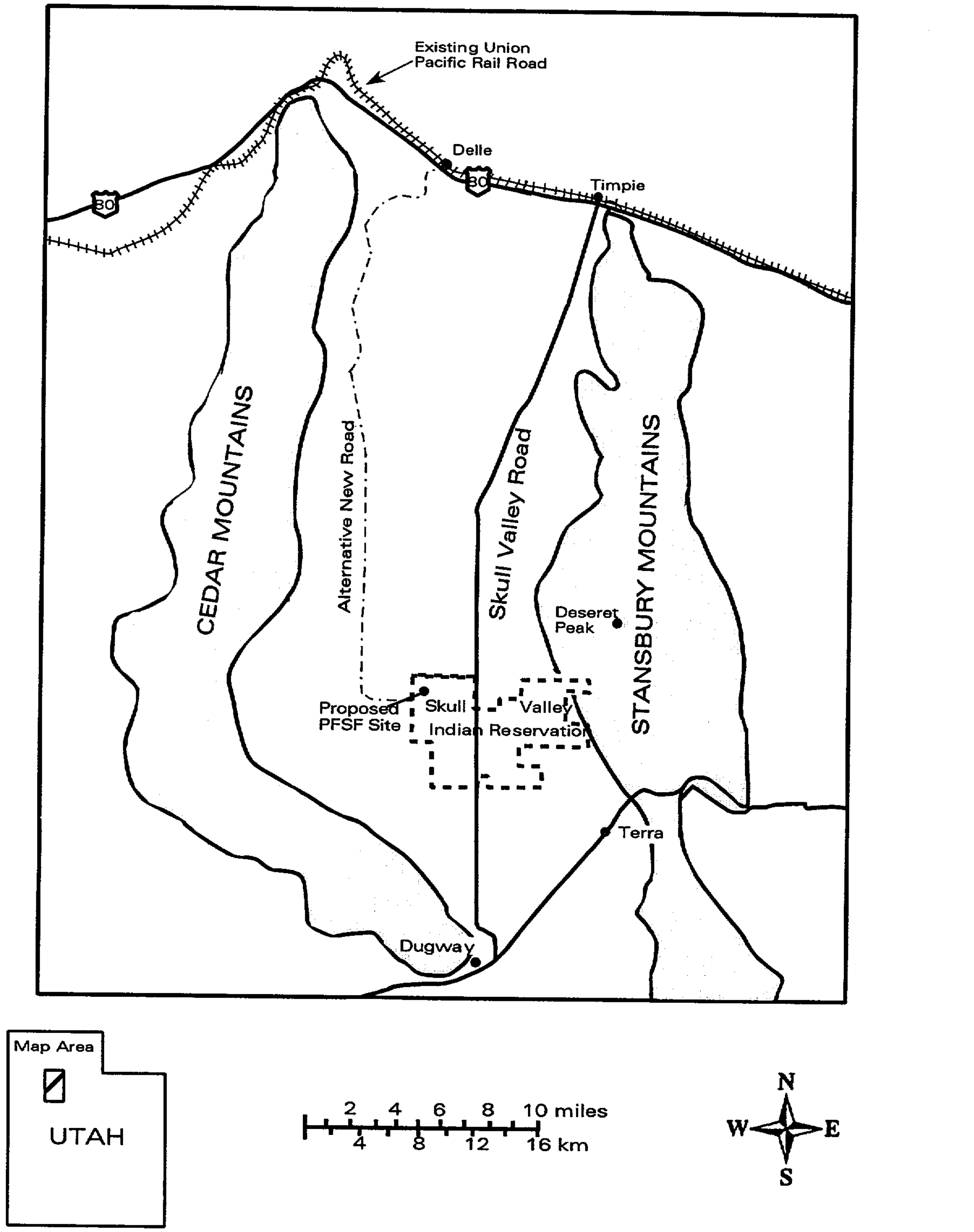


Figure 2.16. Alternative route for a new road in the western portion of Skull Valley.

3. POTENTIALLY AFFECTED ENVIRONMENT IN SKULL VALLEY, UTAH

This chapter describes the existing natural resources and the environmental characteristics of Skull Valley, Utah. The descriptions provided in this chapter focus on the proposed location for the proposed PFSF on the Reservation, as well as on the location for the proposed new Skunk Ridge rail siding and rail corridor. A description of the location for the alternative ITF near Timpie is also included.

The information and data presented in this chapter provide a baseline description of the environment against which the various alternatives from Chapter 2 are evaluated in Chapters 4 and 5. The information presented in this chapter serves as the reference point against which the changes to the environment, both positive and negative, are assessed.

This chapter presents information on (a) geology, minerals, and soils, (b) water resources, (c) climate and air quality, (d) ecological resources, (e) socioeconomic and community resources, (f) cultural resources, (g) background radiological characteristics, and (h) other environmental features, including ambient noise levels, scenic qualities, and recreation.

3.1 Geology, Minerals, and Soils

This section provides a brief description of regional and local geology and identifies the characteristics of soils and mineral resources in Skull Valley. As described in Section 1.5.1, the NRC's process for reviewing the PFS license application includes an examination of the ability of the facility's design to withstand earthquakes. The discussion of geology in this section, however, is not intended to support a detailed safety analysis of the facility to resist seismic events. The NRC staff is reviewing the PFSF's seismic design and will document its analysis in its SER. To assist the reader, Table 3.1 identifies the different geologic period.

3.1.1 Geology

Skull Valley is located within a topographic valley about 35 km (22 miles) east of the Great Salt Lake Desert and about 80 km (50 miles) west of Salt Lake City. As shown in Figure 1.1, the valley is bounded on the east by the Stansbury Mountains, where Deseret Peak rises to a maximum elevation of over 3,300 m (11,000 ft) above sea level [or approximately 1,600 m (5,500 ft) above the valley floor]. The Cedar Mountains are located to the west of the valley and rise to elevations of approximately 2,300 m (7,700 ft) above sea level.

The proposed PFSF location lies within a sediment-filled structural basin in the eastern portion of the Basin and Range Province. This physiographic province is characterized by a roughly north-to-south trending series of fault-bounded, alternating ranges and basins. The eastern boundary of the Basin and Range Province is located at the Wasatch Front, about 90 km (55 miles) east of the proposed PFSF location. During the Miocene, Pliocene, and Pleistocene Epochs, normal faults west of the Wasatch Range uplifted and tilted large blocks of the earth's crust into the north-to-south-trending

Table 3.1. Geologic time scale

Era	Period	Epoch	Relevant formations	Age (millions of years)
Cenozoic	Quaternary	Holocene		0.1 to present
		Pleistocene	Lake Bonneville	1.6 to 0.1
	Tertiary	Pliocene		5.3 to 1.6
		Miocene	Salt Lake	23.7 to 5.3
		Oligocene		36.6 to 23.7
		Eocene		57.8 to 36.6
		Paleocene		66.4 to 57.8
Mesozoic	Cretaceous			144 to 66.4
	Jurassic			208 to 144
	Triassic			245 to 208
Paleozoic	Permian			286 to 245
	Carboniferous	Pennsylvanian	Oquirrh Group	320 to 286
		Mississippian	Deseret	360 to 320
	Devonian			408 to 360
	Silurian			438 to 408
	Ordovician		Fish Haven	505 to 438
	Cambrian		Prospect Mountain	570 to 505

basin and range structures that exist today. The "range" portion of these structures include the Cedar and Stansbury Mountains while the "basins" include Skull Valley.

The Wasatch Front delineates the boundaries between the Great Basin to the west, the Colorado Plateau in southeastern Utah, and the Middle Rocky Mountains in northeastern Utah. The Wasatch Front is part of a distinct north-trending zone of elevated seismic activity which extends from northern Arizona to northwestern Montana. This 100-km (60-mile) wide by 1,300-km (800-mile) long zone has been identified as the Intermountain Seismic Belt (ISB) by Smith and Sbar (1974). The ISB encompasses a region which has experienced more than 15 recorded earthquakes with magnitude greater than 5.5, including one 7.1 magnitude event in 1959 at Hebgen Lake, Montana. The Skull Valley site lies at the western boundary of this region.

The proposed PFSF site is situated between the Stansbury Mountains on the east and the Cedar Mountains on the west. The top of bedrock occurs at depths ranging from 520 to 880 ft (PFS/SAR 2000) and is composed of Cambrian through Tertiary units (Geomatrix 1999). The Cedar Mountains are underlain by the Pennsylvanian Oquirrh Group (Hintze 1971). The Stansbury Mountains are underlain by the lower Cambrian Prospect Mountain Quartzite. Hickman Knolls, located about 1.6 km (1 mile) south of the proposed site, has been mapped as Fish Haven Dolomite of Ordovician age. Hickman Knolls is recognized as a dolomitic mega-breccia. About 1.6 km (1 mile) northeast of the site, a series of low hills (Castle Rock Knoll) have been mapped as Deseret Limestone of Mississippian age (Moore and Sorenson 1979).

The valley is filled with more than 150 m (500 ft) of interbedded alluvial (stream) and lacustrine (lake) sediments that developed from alluvial fans from the bordering mountains or from ancient Lake Bonneville lacustrine deposition, respectively. Generally, alluvial deposits are coarser-grained near the margins of the adjacent mountains and become finer-grained as they extend toward the valley axis.

Valley fill sediments consist of Tertiary-aged siltstones, claystones, and tuffaceous sediments of the Salt Lake Formation unconformably overlain by Quaternary-aged lacustrine deposits. Particularly within the last 700,000 years, sedimentation in the valley was associated with fluctuations in the Bonneville Basin. Sediments from the most recent such fluctuations (from about 12,000 to 28,000 years ago) were associated with different lake stages of ancestral Lake Bonneville. The presence of two prominent paleosols (ancient soils) that developed between periods of lacustrine sedimentation were used for stratigraphic correlation of the uppermost sediments at the proposed site. A detailed physical and stratigraphic description of the basin fill sediments is presented in Geomatrix (1999).

3.1.2 Seismic Setting

The region has a long recorded history of seismic activity. Prior to the installation of a State-wide network of seismic stations in 1962, most records were based on anecdotal reports. PFS tabulates (PFS/ER 2000) 113 earthquakes that have occurred from 1850 to 1961. The largest measured historic earthquake that has occurred in the area was magnitude 6.6 in the northern end of the Great Salt Lake about 140 km (90 miles) north of the proposed PFSF site. This earthquake produced 50 cm (20 inches) of vertical ground displacement along a zone 12 km (7.5 miles) long (PFS/ER 2000). The closest magnitude 5.0 or greater earthquakes occurred about 67 km (42 miles) northeast of the site.

The Stansbury Fault, East Cedar Mountains Fault, and mid-valley faults (East, West, and Springline Faults; see Figure 3.1) are geologic structures that can contribute to the seismic hazard at the site. In the event of earthquake-induced displacement on one of the mid valley faults, displacement could be transferred to other mid-valley faults. Similarly, displacements originating in one segment of the Stansbury Fault or East Cedar Mountains Fault could be transferred to other segments. Details of both probabilistic and deterministic seismic hazard analyses and the effects of ground surface rupture resulting from an earthquake in Skull Valley are available in PFS's SAR (PFS/SAR 2000).

The adequacy of the proposed PFSF to withstand earthquakes will be addressed in the NRC's SER and is not addressed further in this DEIS.

3.1.3 Soils

Site subsurface materials consist of ancestral Lake Bonneville lacustrine (lake) and aeolian (windborne) deposits. Geomatrix (1999) describes thin [nominally 30 cm (1 ft) thick] soils from three test pits in the immediate area of the proposed action. Soils are described as both overlying and underlying aeolian deposits but occurring within the upper 1 m (3 ft) of the subsurface. Organic content is reported to be low (no more than 20 percent to 30 percent) to nonexistent. Soils were generally not identified in the remaining 22 test pits located outside the immediate area of the proposed action.

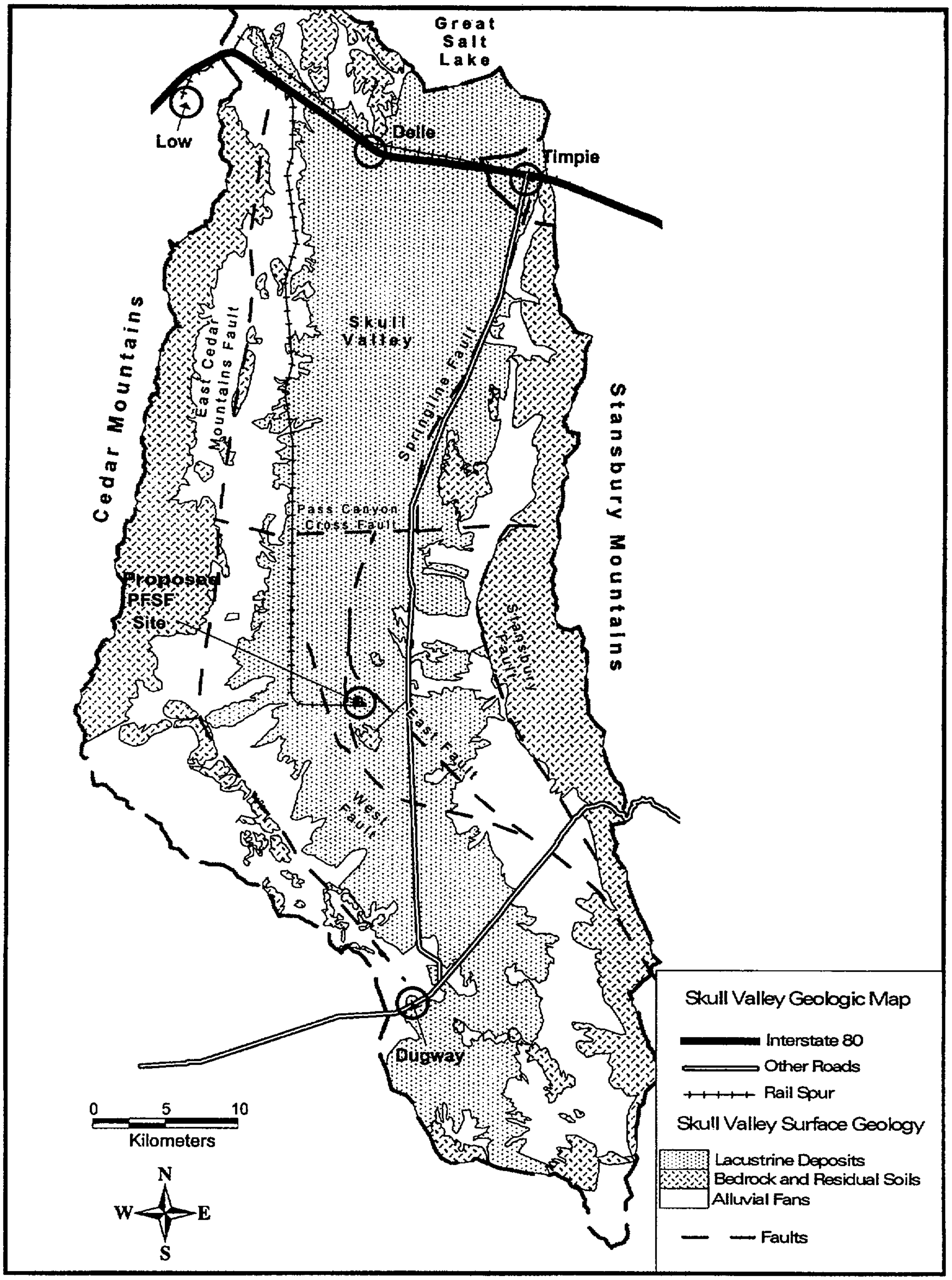


Figure 3.1. Mapped and interpreted surface and subsurface structural features in the immediate area of the proposed site.

In a series of test borings aligned east-to-west along the center of the proposed project area, Geomatrix (1999) describes an upper 0.6 to 1.2 m (2 to 4 ft) of silt and soil underlain by silty clay to depths of nominally 2.4 to 2.7 m (8 to 9 ft). Similar borings aligned east-to-west along the northern boundary of the proposed project area are described similarly in the project SAR. Water content of the silty clay materials varied from about 9 percent to more than 50 percent. The similarity of the descriptions in the two reports suggests that material occurrences are relatively uniform throughout the proposed action area, although the precise depths of occurrence may vary.

The following description is from information provided by Tooele County, Utah (W. Brodersan, Natural Resources Conservation Service, U.S. Department of Agriculture, Salt Lake City, Utah, personal communication to R. R. Lee, Oak Ridge National Laboratory, Oak Ridge, Tenn., February 17, 2000). The description begins at Skunk Ridge and progresses southward to the proposed PFSF site at the Reservation. Soils at the ITF site near Timpie are mapped the same as those at the proposed PFSF site, and their description is combined with that for the proposed site below. Because there is no abrupt or clearly-defined location at which the soil types change along the proposed rail route, only general descriptions are provided below.

Soils at the northern end of the new rail line are well-drained gravelly to very gravelly sandy loam with good roadfill characteristics. They are poor as sand and gravel resources because of excess fines, and also poor as topsoil because of the abundance of small stones. Permeability is moderately rapid [5 to 15 cm/hr (2 to 6 inches/hr)] with a low shrink-swell potential. Organic content is between 0.5 and 1 percent. Water erodibility is low, while wind erodibility is moderate.

Further south along the proposed rail corridor, these soils change to a fine sandy loam. They are improbable as sand and gravel resources because of excess fines and fair to poor as topsoil because of excess salt and small stones. Permeability is moderately rapid [5 to 15 cm/hr (2 to 6 inches/hr)] with a low shrink-swell potential, and pH varies from 7.9 to 9.0. Organic content is between 0.5 and 1 percent. Water erodibility is moderate, and wind erodibility is high.

Soils along the southern-most portions of the proposed rail line and at the preferred site (Site A), the alternative site (Site B), and the ITF site near Timpie are a silty clay loam. They are improbable as sand and gravel resources because of excess fines, poor for topsoil because of excess salt, and poor for roadfill because of their low strength. Permeability is moderately slow [0.5 to 1.5 cm/hr (0.2 to 0.6 inches/hr)], and the soils have a low to moderate shrink-swell potential. Organic content varies from 0 to 1 percent, and pH varies from 7.9 to 9.0. Erodibility to both water and wind is moderate.

PFS has expressed confidence that the material generated in "cut" areas along the proposed rail line would be suitable for use in "fill" areas (PFS/ER 2000). The final design is expected to balance cut and fill areas.

3.1.4 Mineral Resources

The State of Utah and the Basin and Range Province have abundant mineral resources. Bon (1995) reports the presence of eleven large mine permits and plants in Tooele County including gold and silver, building stone, industrial minerals, and salt. Of these, the closest to the proposed PFSF site is a 5-ha (12-acre) surface quarry of aragonite dimension stone located about 10 km (6 miles) south of Low in the Cedar Mountains. Slightly further south and on the western flank of the Cedar Mountains, Tripp et. al. (1989) report the presence of several limestone and dolomite quarries and one iron prospect near Hastings Pass. Tripp et. al. (1989) also report a small prospect of unidentified material located about 3 km (2 miles) southeast of Horseshoe Springs, two small iron claims about 13 km (8 miles) southeast of Horseshoe Springs, and another small iron prospect immediately north of the Reservation at the foot of the Stansbury Mountains. Numerous small claims of unidentified commodities and one small multi-metal claim are also reported by Tripp et. al. (1989) to be near the foot of the Stansbury Mountains southeast of the Reservation and adjacent to a small silica sand deposit located on the eastern edge of the valley about 13 km (8 miles) northeast of Dugway. Tripp et. al. (1989) report a very large sand and gravel resource in the Tooele quadrangle while lacustrine deposits are the chief resources that contain large quantities of high-quality aggregate.

Gloyn (1999) reports the potential for shallow mineral deposits in the immediate vicinity of the proposed site and surrounding area. The most likely mineral types are copper with the potential for surrounding lead-zinc-silver or gold-silver. Minor but numerous lead-zinc-silver, iron, copper-silver, and arsenic-antimony-silver mines and prospects are noted in the adjacent Cedar and Stansbury Mountains. Several similar suspected gold or silver claims are also noted in Skull Valley. Most of the claims in both the valley and adjacent mountains are reported by Gloyn (1999) to have lapsed, suggesting a past but discontinued interest in the area at present.

BLM (1999) reports five existing sand and gravel pits and six oil and natural gas leases in or near the proposed action area. Two active mining claims are identified on the eastern flank of the Cedar Mountains, and the entire length of Skull Valley has been identified as prospectively valuable for oil and gas minerals. Much of the valley north of the proposed site is also prospectively valuable for geothermal resources.

PFS has identified five commercial sources of construction materials between 10 and 77 highway km (6 and 48 highway miles) from the proposed PFSF site (see Figure 3.2). These five sites are described in Table 3.2 and are estimated to contain sufficient aggregate materials to meet construction and operational material needs for the proposed project, the ITF near Timpie, and the Skunk Ridge rail siding and corridor. All of the sites in Table 3.2 are on private land.

3.2 Water Resources

3.2.1 Surface Water Hydrology and Quality

3.2.1.1 General Site Setting

The proposed PFSF in Skull Valley (see Figure 1.1) would be located approximately 39 km (24 miles) south of the present shoreline of the Great Salt Lake. In the Late Pleistocene Epoch (see Table 3.1), Skull Valley was inundated by Lake Bonneville, the predecessor of the existing Great Salt Lake.

Skull Valley lies between the Stansbury Mountains to the east and the Cedar Mountains to the west. Figure 3.3 shows the locations of drainage channels, springs, and surficial geology/soil. Annual precipitation in Skull Valley ranges from 18 to 30 cm (7 to 12 inches) while the adjacent Stansbury mountains receive up to about 100 cm (40 inches) and the Cedar Mountains receive 40 to 51 cm

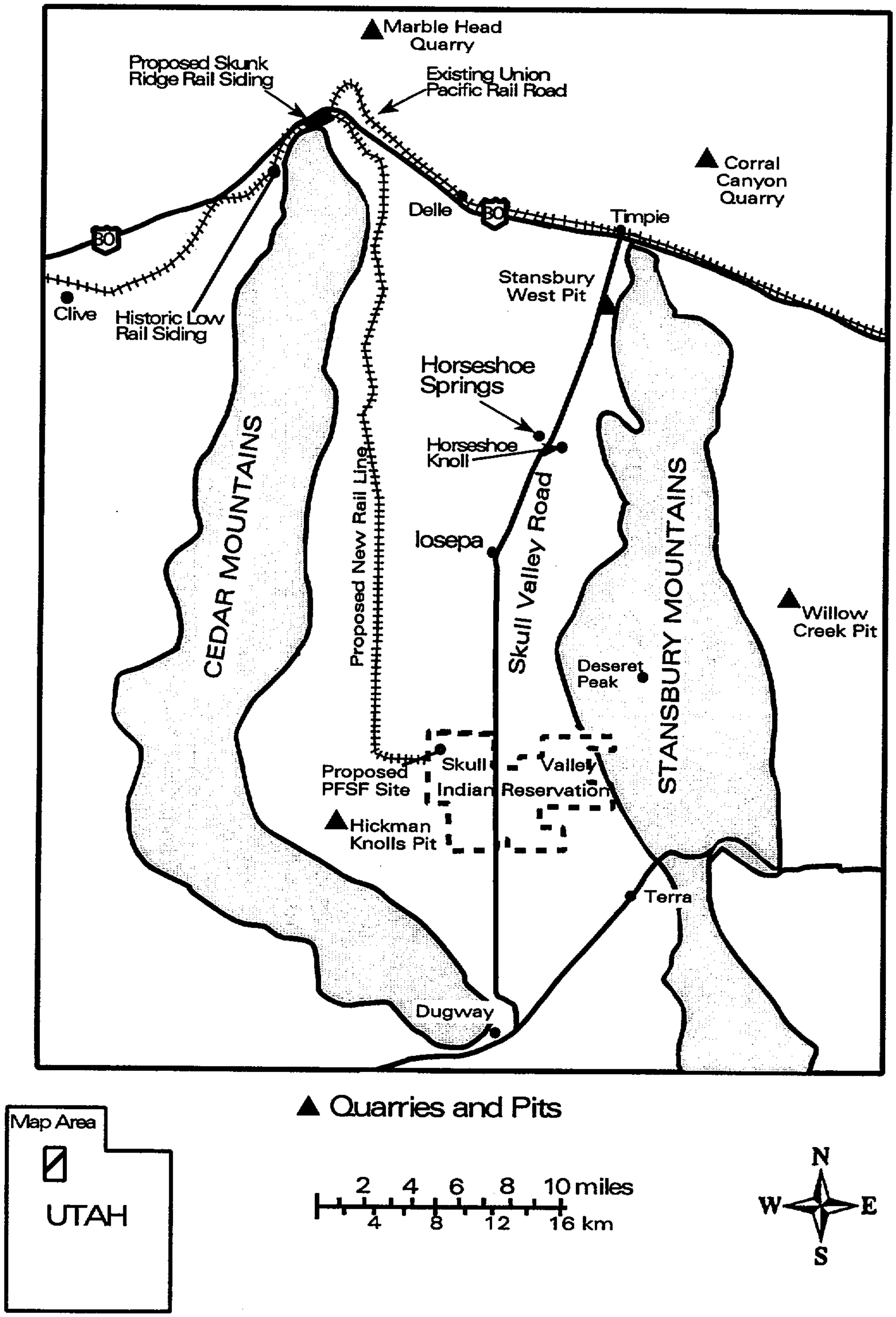


Figure 3.2. Locations of potential sources of construction aggregate in Skull Valley.

Table 3.2. Types of construction materials and their quantities available in the vicinity of Skull Valley

Type of material	Site 1	Site 2	Site 3	Site 4	Site 5	Total
Sand	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Crushed rock (1")	164,000 m^3 (214,000 yd^3)	137,000 m^3 (179,000 yd^3)	164,000 m^3 (214,000 yd^3)	NA	NA	465,000 m^3 (607,000 yd^3)
Small road base (≤1")	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Large road base (approx. 1.5")	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Structural fill material (1½" minus)	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Common fill	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Sub-ballast	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Ballast	NA	NA	NA	219,000 m^3 (286,000 yd^3)	219,000 m^3 (286,000 yd^3)	438,000 m^3 (572,000 yd^3)

Site 1: The Stansbury West Pit, approximately 27 km (17 miles) north of the proposed PFSF site.
Site 2: The Hickman Knolls Pit, approximately 10 km (6 miles) west of the proposed PFSF site.
Site 3: The Willow Creek Pit, approximately 77 km (48 miles) north-east of the proposed PFSF site.
Site 4: The Corral Canyon Quarry, approximately 61 km (38 miles) north-northeast of the proposed PFSF site.
Site 5: The Marble Head Quarry, approximately 56 km (35 miles) north of the proposed PFSF site.

Note: Distances reported to the five sites above are highway/road miles.

(16 to 20 inches) of precipitation (PFS/ER 2000). Based on data collected between 1997 and 1998, approximately 26 cm (10.2 inches) of precipitation fell annually at the site. Much of the precipitation falls as snow. Snowmelt provides flow in streams, most of which are intermittent, that drain the mountains.

Local drainage features are poorly developed dry washes [<0.3 to 0.66 m (<1 to 2 ft deep)] that may carry flows temporarily during spring snowmelt or during infrequent summer thunderstorms. Because of the arid climate and geologic conditions in and around the mountains, most of the runoff from the mountains either evaporates or infiltrates into alluvial materials near the margins of Skull Valley. Infiltration of runoff from the mountains recharges aquifers in the alluvial fans that extend beneath Skull Valley. There are few perennial streams in Skull Valley and none near the site of the proposed PFSF.

The total watershed area of Skull Valley is approximately 1,800 km^2 (446,000 acres). Surface water runoff generally drains from south to north into the Great Salt Lake. The proposed site is located on the northern toeslope of Hickman Knolls, a bedrock knob near the center of the valley. Hickman Knolls and the slightly elevated land surface around the base of the knolls form an area of high ground in the valley. The proposed PFSF site is located on this slightly elevated portion of the Skull Valley floor. The local topography is comprised of a series of north-trending shallow washes that carry surface runoff from the site and upslope areas to the south near the knolls.

The proposed site location is on an upland area that forms a drainage area boundary between the main axis of Skull Valley and a southwestern drainage area that drains a portion of the Cedar Mountains (see Figure 3.3). The drainage basins, as described below, were determined during the flood analysis conducted as part of NRC's safety review (see NRC/SER 2000). The site is centrally located in the watershed, with 48 percent of surface drainage area upstream and 52 percent downstream. About 700 km^2 (173,000 acres) of drainage basin lie to the south (upstream) of the proposed PFSF site in the main upstream watershed area, approximately 165 km^2 (41,000 acres) lie upslope to the southwest toward the Cedar Mountains, and approximately 948 km^2 (234,000 acres) lie downstream of the site toward the Great Salt Lake.

There are no perennial lakes or ponds within 8.5 km (5 miles) of the proposed PFSF site or along the proposed Skunk Ridge rail corridor other than a few stock ponds or small reservoirs used to store irrigation water (PFS/ER 2000). There are no public or private surface water sources in Skull Valley.

The stream nearest to the proposed PFSF site is Indian Hickman Creek, which flows westward from the Stansbury Mountains onto the Reservation. This creek feeds the Reservation's water supply reservoir. Indian Hickman Creek originates from springs in the mountains and has recorded flowrates at the Reservation boundary of 70 to 90 L/s (2.5 to 3.1 ft^3/s) from April 6 to June 5.

The stream channel feature nearest to the proposed site is approximately 500 m (1,500 ft) to the northeast, is up to 1 m (3 ft) deep, and is 2 to 2.5 m (6 to 8 ft) wide in places (PFS/ER 2000). No flow was observed in this channel during the observation period June 1996 through February 1997 (PFS/ER 2000). The nearest perennial surface water flow downstream of the proposed PFSF site is 16 km (10 miles) to the north (PFS/ER 2000).

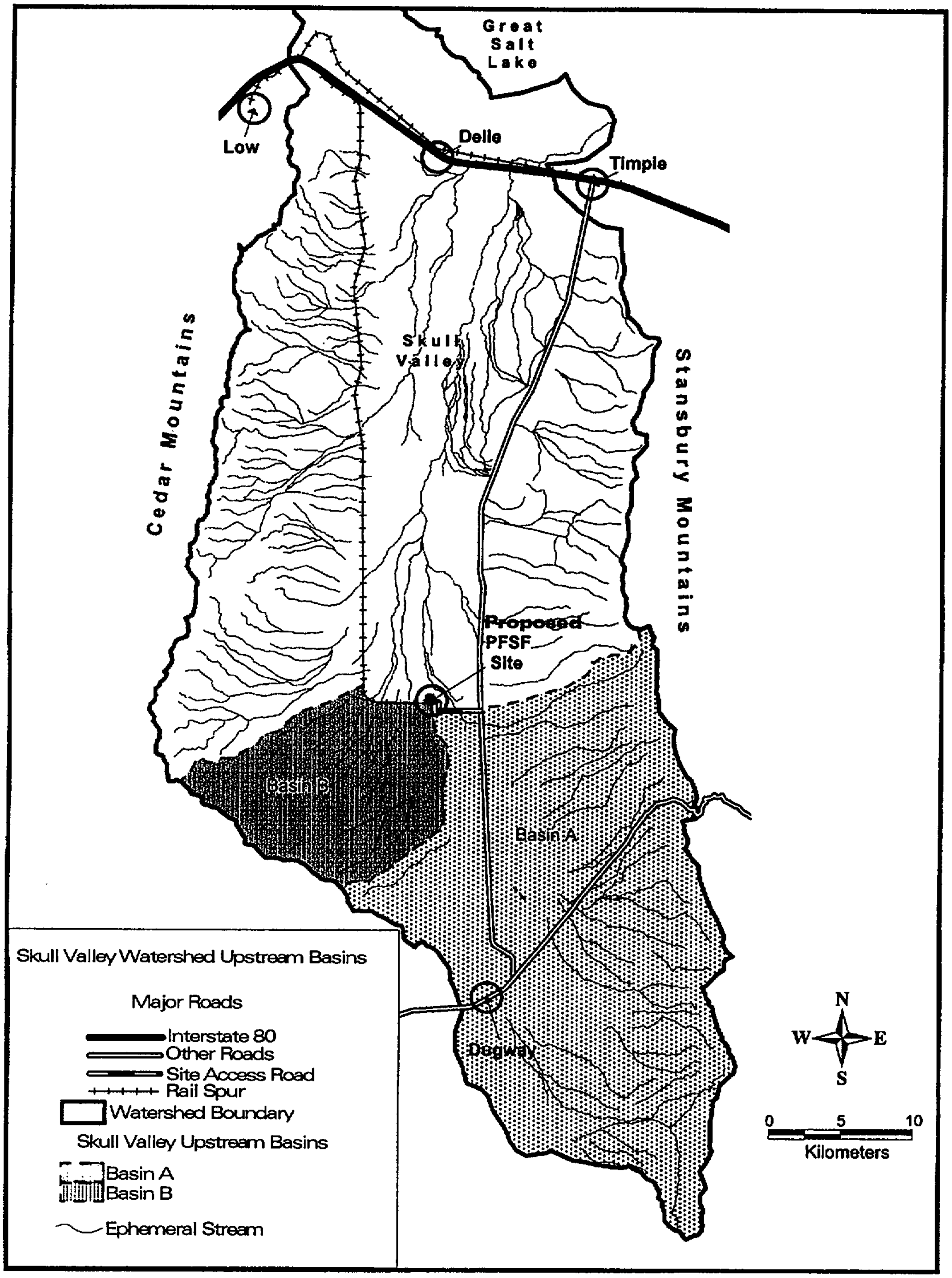


Figure 3.3. Drainage channels and soils/surficial geology in Skull Valley. 1

3.2.1.2 Flooding

Flooding is an extremely rare event in the Skull Valley area. The proposed site lies on an elevated drainage basin boundary on the northern toeslope of Hickman Knolls. The direct upslope drainage area that would generate overland flow onto the site between Hickman Knolls and the site is approximately 260 ha (640 acres). Access routes to the proposed site, including the access road from Skull Valley Road to the Skunk Ridge rail corridor, cross other areas with larger upslope drainage areas. After heavy rainfall or snowmelt, surface runoff in the normally dry washes in the vicinity of the proposed site and access routes could exceed the channel capacities and flooding could occur. During 1982 and 1983, much of the State of Utah experienced unusually high annual precipitation [i.e., 38 cm (15 inches) and 33 cm (13 inches), respectively, compared to an annual average of 20 cm (7.7 inches)]. Adverse effects on the stability of Skull Valley Road were noted. According to Kaliser (1989), Skull Valley Road was softened sufficiently that two heavy transport carriers were adversely affected. One vehicle sank into the asphalt, presumably because of softening of road fill under the pavement, and the other overturned. It is not apparent that substantial improvements have been made to Skull Valley Road to prevent similar occurrences.

As described in the previous section, the upstream area that could contribute runoff to potential floods is subdivided into two basin areas–Basin A, and Basin B (NRC/SER 2000). Basin A includes approximately 700 km^2 (173,000 acres) of southernmost Skull Valley. Basin B includes approximately 165 km^2 (41,000 acres) of runoff area to the south of the PSF site. The Basin A dry stream channel approximately 500 m (1,500 ft) northeast of the site would carry floodflows from an upstream basin area of approximately 700 km^2 (173,000 acres). The minor drainage channels that exist on the site would be supplied by sheet flow from the area south of the site to Hickman Knolls during extreme rain events.

In 1986, the Great Salt Lake flooded to a historic high level of 1283.8 m (4211.85 ft) above sea level. Planning documents issued by the State of Utah Department of Natural Resources in January 1999 have designated the floodplain elevation of the Lake as 1284 m (4212 ft) for planning purposes and 1285 m (4217 ft) as the extent of the Lake's floodplain. Neither of these elevations is above the elevation of the ITF; hence, there is no potential for flooding at the ITF location near Timpie.

Components of the proposed PFSF project for which flood impact has been reviewed include the facility, the site access road from Skull Valley Road, and the rail line access route. Flooding impacts are discussed in Sections 4.2 and 5.2.

3.2.2 Groundwater Hydrology and Quality

Groundwater in the region is generally recharged in the mountains and alluvial aprons on their flanks adjacent to the valleys. Perennial and ephemeral springs are commonly found near the toes of the alluvial aprons. Groundwater flow is generally northward toward the Great Salt Lake.

Skull Valley is a typical Basin and Range valley that contains a thick accumulation of sediment derived from erosion of the adjacent mountain ranges. The best source of groundwater in Skull Valley in terms of both quantity and quality is the alluvial aquifer along the eastern edge of the valley that receives recharge from streams that drain the Stansbury Mountains. Toward the center of Skull Valley, the Salt Lake Group of Tertiary age (see Table 3.1) comprises the majority of the valley fill and ranges in thickness from 600 m to more than 1,800 m (about 2,000 to 6,000 ft) (PFS/ER 2000).

The Salt Lake Formation is approximately 150 to 245 m (500 to 800 ft) thick at the site and is assumed to contain sand, silt, marl, and tuff in varying states of consolidation (PFS/ER 2000).

In Skull Valley groundwater is supplied from unconsolidated or semi-consolidated sediments that form from alluvium fan deposits. Groundwater is estimated by Hood and Waddell (1968) to be between elevations of about 1,310 and 1,326 m (4,300 and 4,350 ft) above mean sea level. The groundwater table was encountered at a depth of 38 m (125 ft) [approximate elevation 1,326 m (4,350 ft)] in site borings. Recharge to the area groundwater system is mainly from infiltration and snow melt runoff on the Stansbury Mountains. The alluvial aquifer along the eastern edge of the valley is recharged by stream infiltration and direct recharge through the coarse grained soils of the coalesced alluvial fans. Surficial soils in the alluvial fans have relatively high infiltration capacities [5 to 15 cm/hr (2.0 to 6.0 inch/hr)], as described in Section 3.1. The combined effects of high evapotranspiration, low precipitation, and moderate infiltration capacity of valley soils [0.5 to 1.5 cm/hr (0.2 to 0.6 inch/hr)] preclude much groundwater recharge in the valley floor area. Seasonal perched groundwater and semi-confined groundwater can be found in valley fill sand and gravel deposits that are overlain by lacustrine silt and clay deposits.

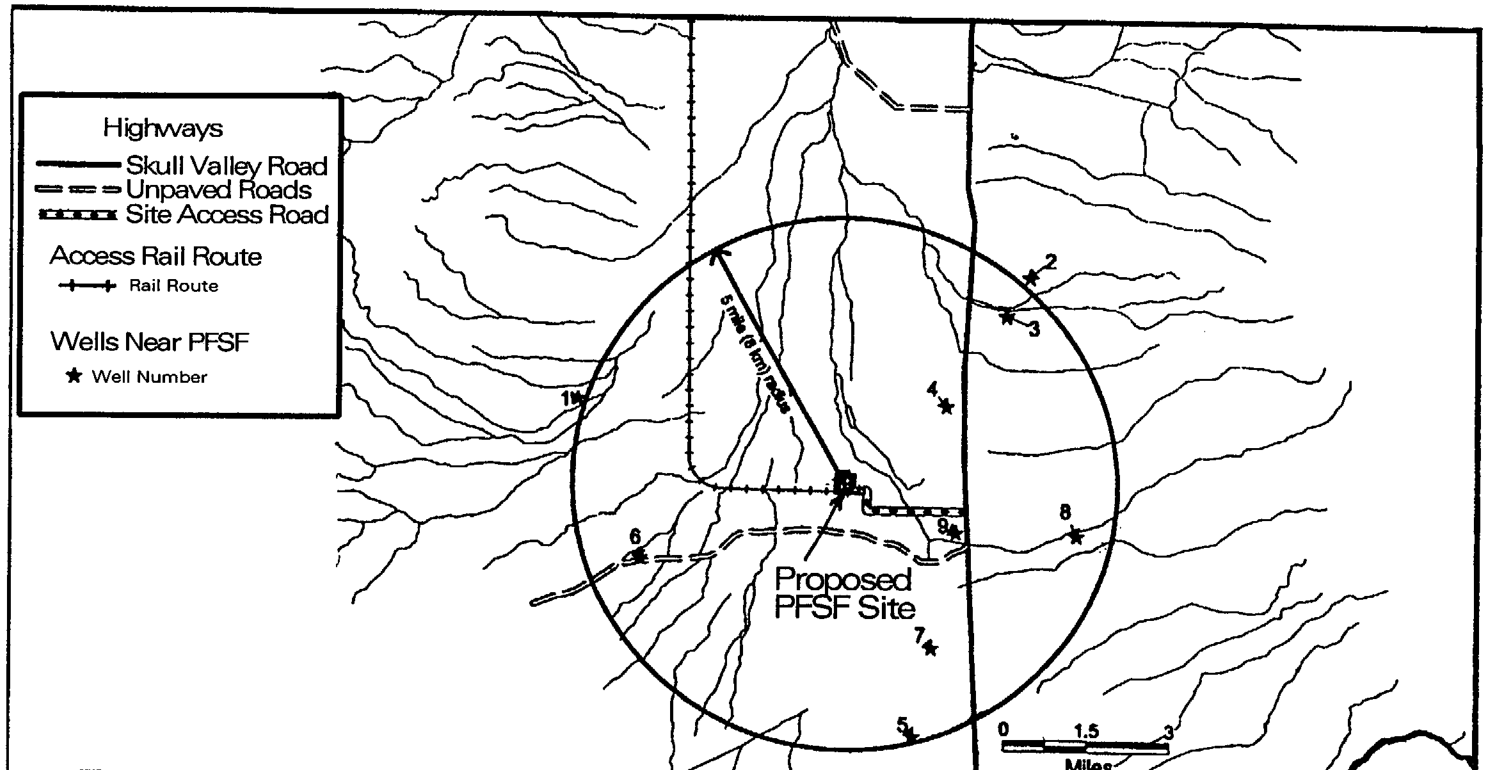
The water table hydraulic gradient beneath the floor of Skull Valley is about 9.5×10^{-4} to the north toward the Great Salt Lake (PFS/ER 2000). The hydraulic conductivity of the water-bearing zone on-site was determined to be approximately 5.0×10^{-5} cm/sec (2.0×10^{-5} inches/sec) in a well test on the proposed PFSF site (PFS/ER 2000). Hood and Waddell (1968) have estimated that annual groundwater recharge and discharge are on the order of 3.7×10^{7} to 6.2×10^{7} m^3 (30,000 to 50,000 acre-ft) with evapotranspiration accounting for 80 to 90 percent of discharge. They also estimate that approximately 9.9×10^{5} m^3/yr (800 acre-ft/yr) underflow out of the valley, presumably to the north. Approximately 6.2×10^{6} m^3/yr (5,000 acre-ft/yr) of groundwater is withdrawn for domestic and agricultural uses.

Groundwater in the alluvial apron along the base of the Stansbury Mountains contains the lowest total dissolved solids (TDS) in the valley, with concentrations from 100 to 800 mg/L. Groundwater can be obtained from the Salt Lake Formation in some areas near the center of Skull Valley although the total dissolved solids content increases toward the center and northern end of the basin. TDS levels between 1,000 and 10,000 mg/L have been reported in central and northern part of Skull Valley (PFS/ER 2000). Sodium and chloride are the principal ions that contribute to elevated TDS in the basin.

3.2.3 Water Use

Sources of potable water for the Reservation and scattered ranches are wells drilled into unconsolidated or semi-consolidated sediments that form the alluvial fan along the toe of the Stansbury Mountains to the east of the proposed PFSF site. No surface water in Skull Valley provides private or public drinking water.

Water use in the valley is estimated at 6.2×10^{6} m^3/yr (5,000 acre-ft/yr) (PFS/ER 2000). Six wells within 8 km (5 miles) of the site have water rights ranging from about 1.4×10^{4} to 2.0×10^{6} m^3/yr (11 to 1,600 acre-ft/yr). Figure 3.4 shows the locations of these wells and indicates ownership and water rights. The well nearest to the site is located approximately 3.2 km (2 miles) away.



Well_No	Owner	Depth	Use	Depth_to_Water	Yield	Water_Right
1	Skull Valley Co., Ltd.	340	Stock Watering	295	35 gpm	Yes (1955) 0.015 cfs
2	Island Ranching Co., Inc.	325	Irrigation, Stock	No Data	No Data	Yes (1959) 2.180 cfs
3	Island Ranching Co., Inc.	347	Irrigation, Stock	90	No Data	Yes (1954) 1.226 cfs
4	Anschutz Land Co., Ltd.	408	Irrigation, Stock	No Data	No Data	Yes (1960) 0.7487 cf
5	Anschutz Land Co., Ltd.	209	Stock Watering	150	No Data	Yes (1948) 0.015 cfs
6	Anschutz Land Co., Inc.	292	Stock Watering	280	20 gpm	Yes (1940) 0.015 cfs
7	Skull Valley Indian Reservation	401	Domestic Industrial	77.5	12 gpm	Not Required
8	Skull Valley Indian Reservation	651	Domestic	519.5	15 gpm	Not Required
9	Skull Valley Indian Reservation	No Data	Domestic	No Data	60 gpm	Not Required

Figure 3.4. Locations of water wells within 8 km (5 miles) of the proposed PFSF.
Note: 1 ft = 0.3048 m, 1 gpm = 3.78541 L/min, 1 cfs = 28.3169 L/sec.

Groundwater uses in Skull Valley include domestic use, livestock watering, and irrigation. Wells are normally completed to depths of between 33.5 and 48.7 m (110 and 160 ft) below ground surface in the unconsolidated alluvial deposits on the east side of the valley where water quality is best. Anecdotal information from the Skull Valley Band indicates annual groundwater fluctuations in their community well of over 33 m/yr (100 ft/yr). This well is about 6 km (4 miles) from the proposed PFSF site.

3.3 Climate and Air Quality

3.3.1 Climate

The broad regional characteristics of the climate of Skull Valley can be described using data from the Salt Lake City International Airport (SLCIA), which has longer records of more meteorological variables than does any other station within 160 km (100 miles). Records for most variables extend back before 1950. However, SLCIA is 80 km (50 miles) northeast of the site of the proposed PFSF, and SLCIA is more strongly influenced by the Great Salt Lake, which is about 16 km (10 miles) to its north.

Records at Dugway, about 19 km (12 miles) south of the proposed PFSF site, extend back to 1950 but do not include all the variables recorded at SLCIA. The monitoring station nearest to the proposed PSFS site is located 3.2 km (2 miles) southeast of the site, at the closest topographically similar location having access to an AC power source; these data are usually called the on-site data in environmental documents relevant to the proposed PFSF. Only two years (1997 and 1998) of such on-site data are available, making the record highly subject to climatic variability of either year. Based on comparisons of the data sets with each other, and with other nearby data from Tooele Army Depot, both sets of data are believed to be generally accurate representations of on-site conditions, and both are used in this DEIS so as to maximize the amount of useful data included in the analysis.

The climate of Skull Valley reflects its mid-latitude continental-interior location; summers are hot and winters are moderately cold. Temperatures at SLCIA rise above 32°C (90°F) on more than half (58 percent) of the days in summer (June through August), and minimum temperatures reach below freezing on about 80 percent of the days in winter (December through February); however, extreme temperatures of −18°C (0°F) or lower only occur on an average of 3 days per winter. The mean January temperature at SLCIA is −2.2°C (28°F); the mean July temperature is 25°C (77°F). Meteorological records for Dugway give the mean January temperature as −2.8°C (27°F), and the mean July temperature as 25.5°C (78°F) (Western Regional Climate Center 1999). The two-year record of on-site data indicates an average January temperature of −0.5°C (31°F) and an average July temperature of 23°C (74°F).

Distance and mountain barriers between Skull Valley and a large source of moisture (i.e., the Gulf of Mexico or the Pacific Ocean) produce a dry climate. Annual average precipitation at Dugway since 1950 has been approximately 20 cm (8 inches), about one-third of which [6.6 cm (2.6 inches)] occurs during the spring months (March, April, and May), with the other two-thirds evenly distributed among the remaining three seasons. The two-year on-site record indicates approximately 26 cm (10.2 inches) of precipitation fall annually. Although the presence of the Great Salt Lake leads to increased precipitation just to the south and southeast of the lake, especially during the winter and spring months when winds are from the north and northwest, the lake's effect on climate at the site of the proposed PFSF is very small.

Because dry air allows more heat to escape upward at night, the difference between daily maximum and minimum temperatures is larger than in relatively moist locations. In summer the area receives over 80 percent of the possible amount of sunshine (Wood 1996), and clouds are scarce; this effect further increases the daily temperature range. The July minimum and maximum temperatures average 16°C (61°F) and 34°C (94°F) respectively (Western Regional Climate Center 1999). January mean daily minimum and maximum temperatures at Dugway average -8.3°C (17°F) and 3.3°C (38°F) respectively.

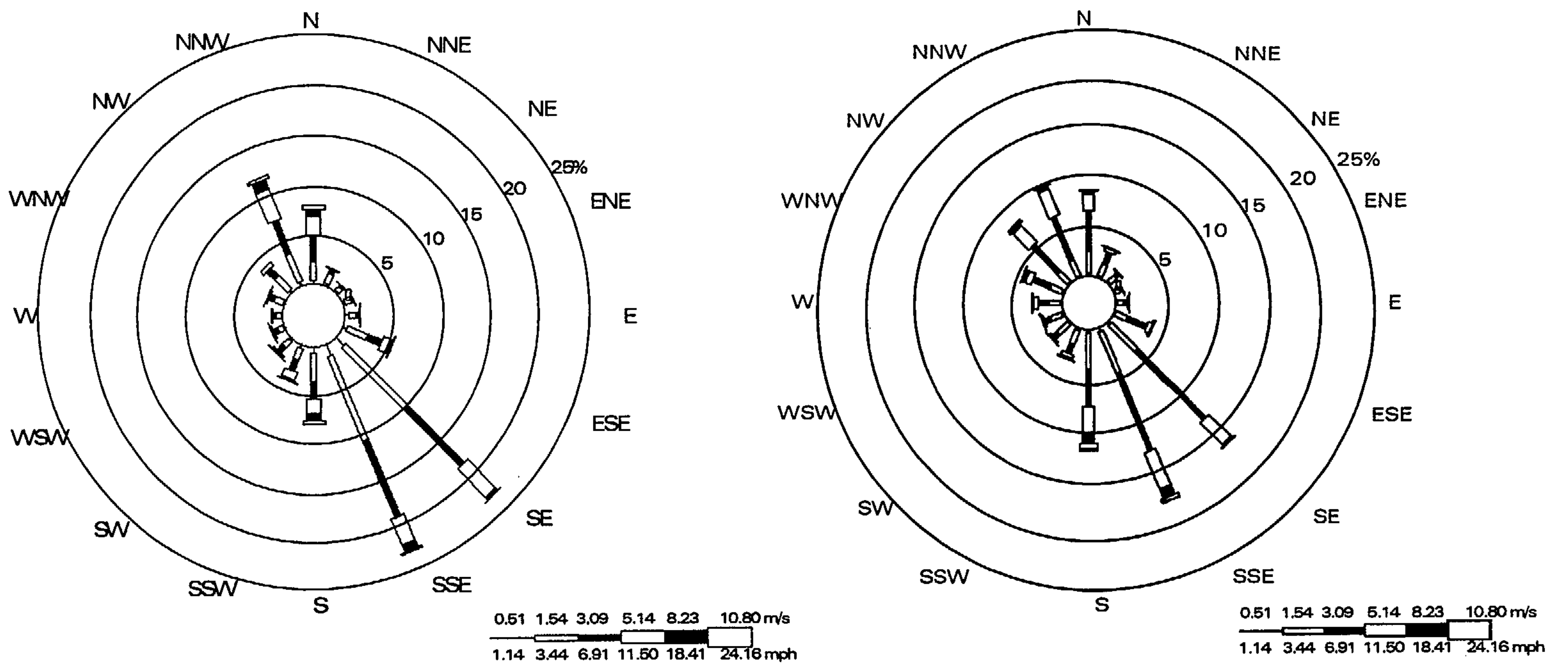
Seasonal variations in relative humidity are large; during the winter, the influence of the Great Salt Lake can provide enough moisture to raise the relative humidity to an average of about 70 percent during daylight hours and about 80 percent during the night at SLCIA, located just to the south-southeast of the Great Salt Lake, where fog occurs on an average of four days per month during winter (Wood 1996). Because Skull Valley is further from the Great Salt Lake and not in a direction of prevailing winds passing over the lake, fog occurrences in Skull Valley would be expected less frequently than at the airport; however, there are no fog data from Skull Valley available for comparison. During summer, when relative humidities at Salt Lake City average around 25 percent during the day and 50 percent at night, fog rarely occurs.

The height above ground to which appreciable vertical atmospheric mixing occurs (the mixing height) is an important factor influencing atmospheric dispersion of pollutants. If mixing height and wind speed are both very low, atmospheric dispersion of pollutants is limited and concentrations of pollutants in a plume originating at any particular source will tend to remain high. Average morning mixing heights over Salt Lake City range from 219 m (719 ft) in the summer to 419 m (1,375 ft) in the spring; these values are lower than for most areas in the United States. Average afternoon mixing heights range from 945 m (3,100 ft) in winter to 3,737 m (12,260 ft) in summer; these values are higher than for most areas in the United States (Holzworth 1972). Because surface temperature is related to mixing height in many meteorological situations, the wide diurnal range of temperature in the region is associated with a correspondingly wide diurnal range of mixing heights.

Winds in the region tend to be aligned with the mountain ranges. Data from the SLCIA indicate that prevailing winds in the area are from the south-southeast or north-northwest; recent (1997–1998) wind data from the Pony Express convenience store, about 3.5 km (2.2 miles) from the site of the proposed PFSF, are in general agreement with the SLCIA data (Figure 3.5). Average annual wind speed is (8.8 mph) at the airport and (8.7 mph) at the on-site monitoring station.

Extreme wind speeds are often given in terms of a "fastest mile," which is the average speed of the air measured over the time interval it would take the air to travel 1 mile at that speed. For example, a fastest mile of 60 mph implies that an average wind speed of 60 mph was measured over a 60-sec period, and a fastest mile of 90 mph implies that an average wind speed of 90 mph was measured over a 40-sec period.

Fastest mile is a traditional measure of sustained wind speed for use in calculating wind loads for design of buildings and other structures; statistical estimates of the highest values expected during periods of 50 and 100 years at Salt Lake City are given by Mehta et al. (1991) as 70 and 75 mph.



Pony Express Convenience Store

Salt Lake City, 1984 - 1991

Figure 3.5. Wind roses for Salt Lake City and for the location near the Pony Express convenience store in Skull Valley. The Skull Valley wind rose is based on meteorological data from December 19, 1996, through December 29, 1998.The percentage of the time the wind is from each direction is plotted as a series of bar segments extending from the center of the diagram toward the direction *from which* the winds come. Wind-speed classes are represented by width and shading of the bar segments; the length of any segment indicates the percentage of all measurements for which the wind is from the indicated direction *and also in* the indicated wind- speed class. Units of wind speed are given in meters per second (m/s) and miles per hour (mph).

Those values are consistent with the highest value of 71 mph at SLCIA, over a 56-year period, given in the Safety Analysis Report (SAR) for the proposed facility (PFS/SAR 2000).

Another measure of extreme wind speed is the peak gust (the highest "instantaneous" wind speed), which will be greater than the fastest mile over the same time period. Statistical estimates of the peak gusts expected during periods of 50 and 100 years are reported in the SAR (PFS/SAR 2000) as 88 mph and 94 mph, respectively.

A tornado probability is typically given in terms of the likelihood of a particular location being within a path of tornado damage in any given year, and is expressed either in terms of the expected number of tornadoes per year or its reciprocal, the expected number of years between tornadoes *at that particular location*. The calculated probabilities are far beyond recorded experience, and, therefore, not always intuitively reasonable. A probability of 1.37 tornadoes per million years (or about 1 tornado per 730,000 years) at the site of the proposed PFSF was obtained by PFS (PFS/ER 2000), based on a typical tornado damage path area of 0.09 km^2 (0.035 $miles^2$). The probability of a tornado creating such a damage path somewhere within an area 10,000 times that large is simply the probability given above multiplied by 10,000, or 0.0137 tornadoes per year. This corresponds to 1 tornado per 73 years within an area of 900 km^2 (350 $miles^2$), which may be thought of as 16 km (10 miles) wide and 56 km (35 miles) long, about the same dimensions as the floor of Skull Valley. To extend this calculation to much larger areas would be meaningless because of the differences in tornado probabilities that are likely to occur in different parts of larger areas (e.g., in the mountains to the east or west).

It was noted by PFS (see PFS/SAR 2000) that Ramsdell and Andrews (1986) give a higher tornado probability, 3.06 in a million, for any particular location in the State of Utah as a whole. Available data would seem to justify estimates of tornado probability ranging from about 1.37 in a million to about 3 in a million, or from about 1 tornado in 33 years to 1 in 73 years occurring somewhere within the 350 square miles area considered above.

A tornado struck downtown Salt Lake City on August 11, 1999; this was the first tornado to strike inside the city limits since 1968. It was also more intense than most tornadoes in Utah; damage-based wind speed estimates were between 100 and 150 mph, leading to a classification of level 2 (i.e., F2) on the Fujita intensity scale. Imprecise measurements of tornado winds, made with Doppler radar, have indicated speeds as high as 318 mph, in an F5 tornado near Oklahoma City on May 3, 1999 (Monastersky 1999; NOAA 1999). However, tornadoes of intensity of F3 or greater, associated with wind speeds greater than about 150 mph (Grazulis et al. 1993), are so infrequent in the Great Basin that calculations of their probabilities are of questionable value. Although the expected damage area of an F3, F4, or F5 tornado is much larger than the more typical value of 0.09 km^2 (0.035 $miles^2$) used above, the probability of occurrence of such a tornado anywhere in Skull Valley is extremely small.

3.3.2 Air Quality

Air quality is evaluated by comparing measured air pollutant concentrations with NAAQS, which have been established by the EPA to protect human health and welfare with an adequate margin of safety (40 CFR Part 50). These national standards apply to six common air pollutants, namely: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), lead (Pb), and particulate matter 10 μm or less in diameter, designated PM-10. These are called *criteria pollutants* because

AIR QUALITY DESIGNATIONS

Attainment Area—Any area that meets the national primary or secondary ambient air quality standard for the pollutant.

Nonattainment Area—Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

the criteria for regulating them must be published (CAA, Section 108). Primary NAAQS define levels of air quality which the EPA deems necessary, with an adequate margin of safety, to protect human health; secondary NAAQS are similarly designated to protect human welfare by safeguarding environmental resources (such as soils, water, plants, and animals) and manufactured materials. Primary and secondary standards are currently the same for all pollutants and averaging periods except for 3-hour SO_2 averages, which have only a secondary standard.

NAAQS are expressed as concentrations of pollutants in the ambient air—that is, the outdoor air to which the general public has access [40 CFR 50.1(e)]. Concentrations of criteria pollutants at locations corresponding to the general guidelines in 40 CFR Part 58, Appendix D, are monitored by EPA to compare air quality with NAAQS. State and local monitoring stations are sometimes available to provide supplementary data. Monitored values of criteria pollutants can be accessed from EPA's Aerometric Information Retrieval System (AIRS) data base, accessible from the EPA home page [(http://www.epa.gov/airsdata/monitors.htm); accessed February 16, 2000].

Tooele County is in attainment of all NAAQS except for an SO_2 nonattainment classification applicable only to those parts of the county above 5,600 ft in elevation. However, the only SO_2 monitoring in Tooele County was discontinued in October 1997 as a result of the low concentrations that were measured (Utah Department of Environmental Quality 1998). Air quality data for 1995 to 1999 from the monitoring stations nearest to Skull Valley are presented, along with their corresponding standards, in Table 3.3.

The SO_2 standards for periods of 24 hours or less apply to the second highest value in a calendar year at any particular location; therefore, the highest value for each year at each monitor was excluded from the data, and the highest of the remaining values (the highest second-highest value) for 1995–1999 is compared with the standards in Table 3.3. All SO_2 concentrations were less than 15 percent of applicable standards.

Like the SO_2 standards for short-term averages, CO standards apply to the highest second-highest concentrations for each year; these concentrations are presented in Table 3.3. Most monitoring for CO is in large cities where traffic congestion leads to long idling times of large numbers of commuter vehicles during rush hour; CO is not generally a pollutant of concern outside of large cities. In Salt Lake City, 8-hour average CO concentrations were as high as 77 percent of the standard during 1996.

Only an annual standard exists for NO_2; annual average NO_2 concentrations at the nearest monitoring station over the past 5 years have always been less than 50 percent of the standard.

Table 3.3. Summary of air quality for the Skull Valley area for 1995–1999

Pollutant	Averaging period	Nearest monitoring location	Year of maximum	National Ambient Air Quality Standard[a]	Concentration[a]	Concentration as a percent of standard
Sulfur dioxide (SO_2)	3-hour[b]	Magna[c]	1995	0.50 ppm	0.040 ppm	8
	24-hour[b]		1995	0.14 ppm	0.015 ppm	11
	Annual[d]		1995	0.03 ppm	0.002 ppm	7
Carbon monoxide (CO)	1-hour[b]	Salt Lake City	1996	35.0 ppm	12.0 ppm	34
	8-hour[b]		1996	9.0 ppm	6.9 ppm	77
Nitrogen dioxide (NO_2)	Annual[d]	Bountiful	1997	0.053 ppm	0.021 ppm	40
Ozone (O_3)	1-hour[e]	Lakepoint	1996	0.124 ppm[e]	0.123 ppm[f]	99
Lead (Pb)	Calendar quarter[d]	Magna	1997	1.5 $\mu g/m^3$	0.1 $\mu g/m^3$	7
Particulate matter $\leq$10 μm in diameter (PM-10)	24-hour[g]	Magna[c]	1998[g]	150 $\mu g/m^3$	87 $\mu g/m^3$	58
	Annual[g]		1997[g]	50 $\mu g/m^3$	22 $\mu g/m^3$	44

[a]Standards and monitored concentrations are expressed as parts per million (ppm) by volume for gases, and as micrograms per cubic meter ($\mu g/m^3$) for lead and particulate matter (40 CFR Part 50).

[b]The highest value for each year has been excluded and the highest of the remaining concentrations is shown for comparison with the standard, as per 40 CFR Part 50.

[c]Grantsville was the nearest monitoring station until 1997; Magna is now the nearest station. Concentrations at Grantsville were generally lower than those at Magna.

[d]The maximum annual (or, for lead, quarterly) concentration during 1995–1999.

[e]The hourly ozone standard applies to the fourth highest value in any three successive years.

[f]The value given is the 4th highest during 1996–1998; during that period, the standard has exceeded the maximum allowable three times and the highest measured hourly concentration was 0.145 ppm at the Lakepoint monitor. The next nearest ozone monitor is in Herriman, where the 4th highest value in any successive three years was 0.111 ppm, and the highest value was 0.115 ppm.

[g]The 24-hour standard is not to be exceeded more than three times in three years, and the annual average refers to the average of three successive annual values (40 CFR Part 50, Appendix K). Years listed as providing the maximum values refer to the ending year of the corresponding 3-year period. On July 18, 1997, EPA promulgated new standards for particulate matter less than 2.5 μm in diameter (PM-2.5) (62 Fed. Reg. 38652); however, the PM-25 standards are the subject of pending litigation (U.S. Court of Appeals, D.C. Circuit, 1999a,b). EPA is requesting review of that decision by the U.S. Supreme Court.

Source: http://www.epa.gov/airsdata/monitors.htm; accessed February 16, 2000.

The 1-hour ozone standard requires that no more than three days in any 3-year period have one or more hourly concentrations in excess of 0.12 ppm by volume (40 CFR Part 50) [when rounded to 2 decimal places in accordance with EPA guidance (see EPA 1979)]. Although concentrations higher than 0.12 ppm occasionally occurred, ozone concentrations never exceeded the standard more than three times in any 3-year period at the nearest monitoring location, in Lakepoint. At the next-nearest monitor, in Herriman, no ozone concentration over the 1-hour ozone standard was recorded from 1995 to 1999.

Lead concentrations in the Salt Lake City area have been less than 10 percent of the standard over the past several years; atmospheric concentrations of lead have been declining in recent years, largely as a result of the reduced use of leaded gasoline.

Standards for particulate matter apply to statistical values derived from three years of data. Near Skull Valley, maximum PM-10 concentrations have recently been around 50 percent of their corresponding standards.

In addition to NAAQS, which represent an upper bound on allowable pollutant concentrations, there are national standards for the prevention of significant deterioration (PSD) of air quality (40 CFR 51.166). The PSD standards differ from the NAAQS in that the NAAQS specify maximum allowable *concentrations* of pollutants, while PSD requirements provide maximum allowable *increases in concentrations* of pollutants for areas already in compliance with the NAAQS (i.e., in attainment). PSD standards are therefore expressed as allowable *increments* in the atmospheric concentrations of specific pollutants. PSD increments are particularly relevant when a major proposed action (e.g., involving a new source or a major modification to an existing source) may degrade air quality without exceeding the NAAQS, as would be the case, for example, in an area where the ambient air is very clean. Allowable PSD increments currently exist for three pollutants (NO_2, SO_2, and PM-10). One set of allowable increments exists for Class II areas, which cover most of the United States, and a much more stringent set of allowable increments exists for Class I areas, which are specifically designated areas where the degradation of ambient air quality is to be severely restricted. Class I areas include many national parks and monuments, wilderness areas, and other areas as specified in 40 CFR 51.166(e). The nearest Class I PSD area is the Capitol Reef National Park, about 240 km (150 miles) south-southeast of the site of the proposed PFSF.

There are no Federal requirements for applying standards for the prevention of significant deterioration (PSD) of air quality to temporary, construction-related, activities such as those associated with the proposed PFSF, and discussed in Section 2.1, or to stationary sources, such as the facility itself, which would not emit significant amounts of pollutants as defined in 40 CFR 51.166.

3.4 Ecological Resources

This section describes the ecological resources of Skull Valley in the vicinity of the proposed and alternative sites for the proposed PFSF, the related transportation corridors, and the ITF near Timpie. The emphasis of this description is on selected plant and animal species, biodiversity, and ecosystems of special concern to the FWS, BLM, and the Utah Division of Wildlife Resources (UDWR) that may be individually or cumulatively affected by the proposed action or alternatives. The concern for potential effects on these resources stems primarily from their importance as threatened, endangered, or special concern species; game species; indicator species; or ecosystems in danger of being eliminated or becoming less diverse.

3.4.1 Terrestrial Resources

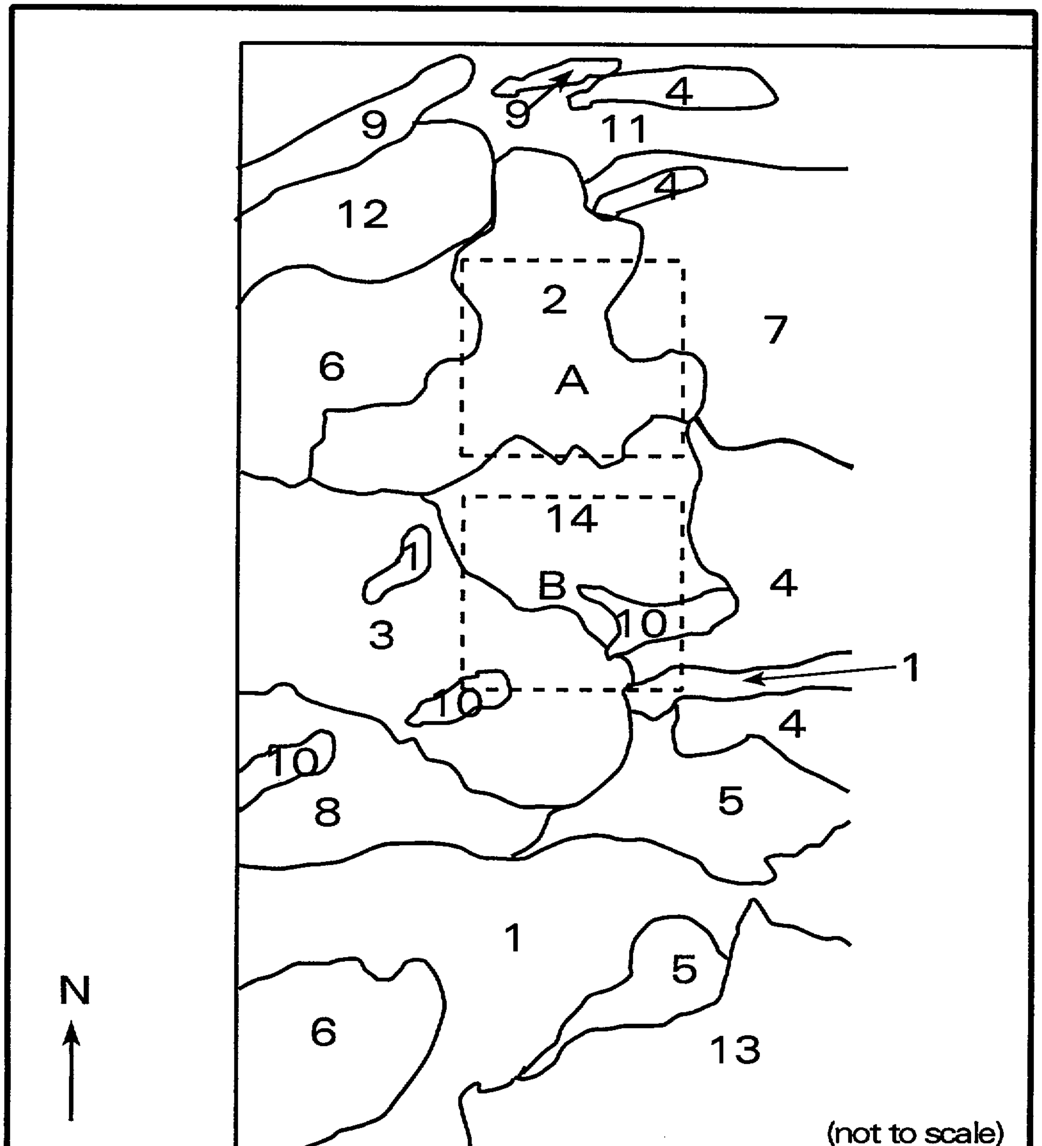
3.4.1.1 Vegetation

Skull Valley is located in the saltbush-greasewood (*Atriplex-Sarcobatus*) section of the Intermountain Sagebrush Province (Bailey 1980; Küchler 1964). This ecosystem consists of open stands of low and dwarf shrubs, dominated by shrubs such as shadscale (*Atriplex confertifolia*) and greasewood (*Sarcobatus vermiculatus*). The mountains on the east and west sides of the valley are classified as juniper-pinyon pine woodland (Küchler 1964) consisting of open groves of low evergreen trees with varying admixtures of shrubs and herbaceous plants. Common trees and shrubs in the valley include big sagebrush (*Artemisia tridentata*), saltbush species (*Atriplex* spp.), shadscale, rabbitbrush species (*Chrysothamnus* spp.), and greasewood, among others (Ehleringer undated). The most abundant grass is an exotic annual weed, cheatgrass (*Bromus tectorum*).

Due to numerous, large fires (primarily caused by lightning), cheatgrass has invaded and replaced the natural vegetation in much of Skull Valley (BLM 1998c). Within the Intermountain Region, extensive wildfires frequently occur on disturbed range and wildlands occupied by annual weeds (Monsen 1995). Wildfires now occur in Skull Valley with a frequency of at least once every three years. Fire can damage vegetation, but it can also stimulate growth and succession (Wright and Bailey 1982). In areas of desert shrub and saltbush vegetation, repetitive fires destroy the native species (BLM 1998c). Since desert shrub and saltbush cannot compete with annual grasses, they do not naturally reestablish; instead, almost pure stands of annual grass become established. Once annual grasses invade, an area becomes increasingly susceptible to subsequent fires. In the absence of fire (approximately every 3 to 5 years), the salt desert shrub will naturally become reestablished.

The Salt Lake District of BLM has adopted a fire management plan for all the resource management areas in the district, including the Pony Express area that covers Skull Valley (BLM 1998c). Most of Skull Valley falls into the fuel type categorized by BLM as annual grass with desert shrub in which wildland fire is not desired. In Skull Valley, BLM's goal is to reduce fire size by using vegetation or fuel management procedure (e.g., prescribed fire, mechanical manipulation, seeding to less flammable and more desirable species, fuelbreak establishment). Prescribed fires and mechanical or chemical treatments would generally be limited to black stripping (i.e., creating a fuelbreak by removing all vegetation), as either a hazardous fuel reduction method or as site preparation for green stripping (i.e., creating a fuelbreak by planting naturally fire-resistant vegetation) projects. The goal of the 1998 Fire Management Plan is to contain 90 percent of fires of all intensity levels at 121 ha (300 acres) or less and to contain fires in areas that consist primarily of native desert shrub species and perennial grasses at 40 ha (100 acres) or less. According to BLM, these objectives may be difficult to achieve under ideal conditions and will require aggressive suppression efforts to achieve.

The proposed and alternative PFSF sites are nearly flat and are dominated by widely-spaced desert shrub species, perennial grasses, and annuals. Figure 3.6 shows the vegetative micro-communities that were identified on the proposed and alternative sites (Stone and Webster 1996). As shown in Figure 3.6, Site A is 70 percent grass and 30 percent bare. The proposed site (Site A) is mainly



Vegetative Micro-Community Codes in Percentages

1. >90 Grass
2. 70 Grass/30 Bare
3. >90 Tall Shrub
4. >90 Low Shrub
5. 90 Grass/10 Tall Shrub
6. 50 Tall Shrub/50 Low Shrub
7. 10 Tall Shrub/90 Low Shrub
8. 90 Grass/10 Shrub
9. 50 Tall Herb/10 Shrub/40 Bare
10. Alkali
11. 50 Low Shrub/50 Grass
12. 40 Tall shrub/40 Low Shrub/20 Grass
13. 10 Rock/60 Grass/30 Tall Shrub
14. 33 Grass/33 Tall Shrub/33 Low Shrub

Figure 3.6. Vegetative micro-communities on the proposed PFSF site (Site A) and the alternative site (Site B) on the Reservation.

vegetated by grasses, with the northeast corner being a community of primarily low shrubs. The alternative site (Site B) has a greater diversity of micro-communities, with shrubs and grasses being the dominant vegetation types. Vegetation observed on the preferred site and along the proposed access road to it includes cheatgrass, sagebrush, shadscale, saltbush, tumbleweed (*Amaranthus albus*), cacti, greasewood, and freckled milkvetch (*Astragalus lentigenosus*). There are no trees, buildings, or structures within either the proposed or alternative PFSF site. With the exception of the Skull Valley Band village, no trees, buildings, or structures are within 8 km (5 miles) of the proposed PFSF site (PFS/ER 2000).

The vegetation at the proposed Skunk Ridge railhead and along the proposed Skunk Ridge rail corridor on the west side of Skull Valley is generally very similar to that found at the proposed and alternative PFSF sites and along Skull Valley Road and includes areas dominated by cheatgrass (PFS/RAI1 1999). The habitat on the west side of Skull Valley is, however, in general, somewhat more open than that on the east side.

The area of the ITF near Timpie is highly disturbed, with no unique ecological communities (PFS/ER 2000). It is dominated by greasewood with native salt desert shrubs and native grasses being sparse to virtually absent (PFS/ER 2000).

Plant species that are considered threatened, endangered, and species of special concern are discussed in Section 3.4.3.1.

3.4.1.2 Wildlife

The open habitats of Skull Valley support a number of wide ranging wildlife species including, among others, pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), eagles, owls, and a variety of hawks including ferruginous (*Buteo regalis*), rough-legged (*Buteo lagopus*) (winter) and Swainson's hawks (*Buteo swainsoni*), and northern harriers (*Circus cyaneus*). The valley (271,000 acres) offers open areas in which these animals may feed, hunt, and winter (BLM 1998; UDWR 1999).

Typical mammal species found in the vicinity of the proposed project site (the habitats are described in Section 3.4.1.1) include ground squirrels (*Citellus sp.*), jack rabbits (*Lepus sp.*), kangaroo rats (*Dipodomys sp.*), mice (*Peromyscus sp.*), coyote (*Canis latrans*), fox (*Vulpes sp.*), badger (*Taxidea taxus*), and skunk (*Mephitis mephitis*) (PFS 1998). Pronghorn antelope, mule deer, and wild non-native (i.e., feral) horses were observed during various surveys in 1998. Skull Valley is an important winter area for these three animal species (UDWR 1999). Mule deer and pronghorn antelope are big game species which occur in Skull Valley. There are approximately 850 mule deer in the West Desert Herd and 13,400 in the Stansbury Herd. Mule deer use both the Cedar and Stansbury mountains, and move down in the valley during the winter. Wintering areas identified by UDWR are to the north of the Reservation, to the east of Skull Valley Road, and in the foothills of the Cedar Mountains (see Figure 3.7). It is likely that mule deer would occur in the vicinity of the PFS site, along Skull Valley Road, and along the Skunk Ridge rail line corridor (UDWR 1997a and 1999).

Pronghorn antelope in Skull Valley would be part of the West Desert Herd Unit 2, which includes approximately 130 animals. This herd, for the most part, uses areas to the west, north, and south of Skull Valley (PFS/ER 2000; UDWR 1999). A herd of approximately 700 horses occupy the Cedar Mountains Wild Horse Herd Management Area. This area encompasses the Cedar Mountains from

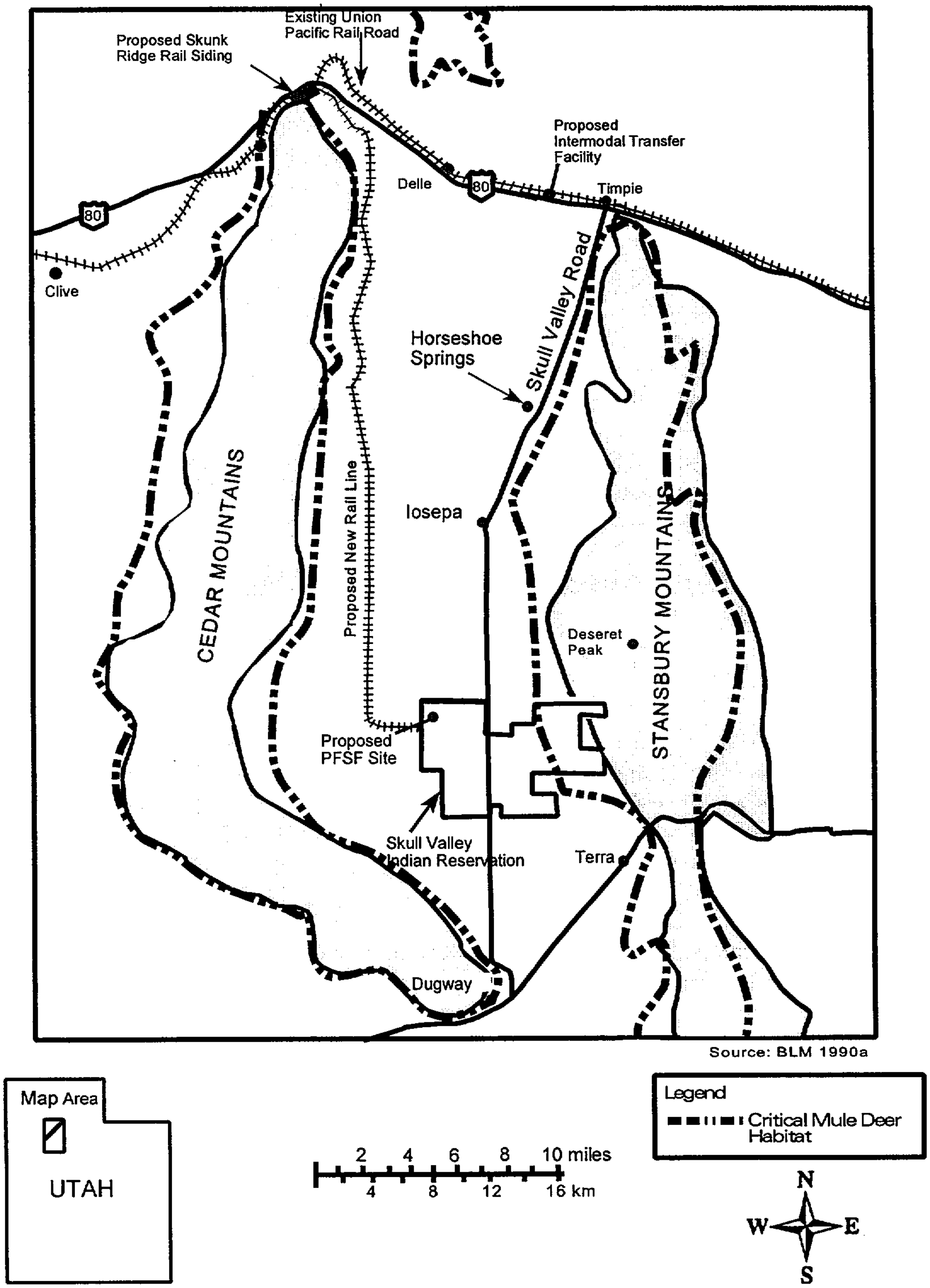


Figure 3.7. Critical mule deer habitat within Skull Valley. 1

Hastings Pass on the north to the Dugway Proving Grounds on the south. The southern portion of the Cedar Mountains is a wild horse herd management area. The proposed PFSF site and the Skunk Ridge rail line corridor may be used as feeding areas by these large mammals, especially during the winter (UDWR 1999; BLM 1988a and 1998).

Birds common to the proposed PFSF site and proposed Skunk Ridge rail line corridor include common raven (*Corvus corax*), black-billed magpie (*Pica pica*), western meadowlark (*Sturnella neglecta*), lark sparrow (*Chondestes grammacus*), horned lark (*Eremophila alpestris*), ferruginous hawk, and kestrel (*Falco sparverius*). Hawk nesting habitat is present along Skull Valley Road, at Hickman Knolls to the south of the proposed PFSF site, in the foothills of both the Cedar and Stansbury Mountains, and in areas where trees occur in Skull Valley. Numerous hawk nesting sites have been identified throughout the valley, including along Skull Valley Road and the proposed Skunk Ridge rail line corridor (PFS/ER 2000; Stone & Webster 1998; UDWR 1997a). Various hawk species currently use the proposed PFSF site as well as the Skunk Ridge rail line corridor as part of their feeding territories.

In the Skull Valley area, there are a number of upland game species. These species include Hungarian partridge (*Perdix perdix*), ring-necked pheasant (*Phasianus colchicus*), chukar (*Alectoris chukar*), and mourning dove (*Zenaida macroura*). Hungarian partridge, ring-necked pheasant, and chukar are exotic game species (National Geographic Society 1983). The partridge and pheasant prefer areas of small grain crops. Areas just north of the Reservation are used to grow alfalfa. UDWR indicate that use areas for both the partridge and pheasant are present within one half mile of Skull Valley Road, north of the project site (UDWR 1999). Chukar are common within habitats of the foothills and slopes of the Stansbury and Cedar Mountains (PFS/ER 2000; UDWR 1997a; UDWR 1999). Chukars may use areas within the proposed Skunk Ridge railroad corridor and just east of Skull Valley Road north of the proposed PFSF site (UDWR 1999). The mourning dove, a native game species, is common throughout Skull Valley, including the Reservation, the Skunk Ridge corridor, and along Skull Valley Road.

Waterfowl, shorebirds, and wading birds use mudflats and wetlands (e.g., Horseshoe Springs) in the northern portions of the valley (see Section 3.4.2.2 for more information on wetlands wildlife). Under the Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. 703, et seq., migratory birds included in the terms of the conventions identified in 16 U.S.C. 703 are protected.

The habitats of the proposed new rail line which is to run south from Skunk Ridge, to the west and north of the proposed PFSF site, are very similar to most of Skull Valley, although, as mentioned in Section 3.4.1.1, the vegetation is somewhat more widely spaced.

The ITF near Timpie is near both Interstate-80 and the Union Pacific railroad. It is a previously disturbed site with little value to wildlife.

Threatened, endangered and other species of special concern are discussed in Section 3.4.3.

3.4.2 Aquatic Resources

3.4.2.1 Perennial and Ephemeral Streams

As discussed in Section 3.2.1.1, Indian Hickman Creek is the stream nearest to the proposed PFSF site. The creek is fed from springs in the Stansbury Mountains and has moderate flow in the wet season. Trout are known to inhabit the creek.

There are no perennial streams found within the area of the proposed or alternative PFSF sites, along the Skunk Ridge transportation corridor, or at the ITF near Timpie. A number of ephemeral or ephemeral stream channels, essentially dry washes, are identified on USGS quadrangles within an 8-km (5-mile) radius of the proposed PFSF site and within 0.8 km (0.5 mile) of the Skunk Ridge transportation corridor. Some of these ephemeral streams may be identified as "waters of the United States" by the Corps of Engineers. However, because of their ephemeral nature, none of them would be expected to support any aquatic biota.

3.4.2.2 Wetlands

Wetlands are important to a wide variety of wildlife, livestock, watershed, and recreation values (BLM 1992a) and are used by wildlife disproportionately more than any other type of habitat (Bridges et al. 1998). In regions such as Utah where water is scarce, roughly 90 percent of the birds and most of the mammals use wetland and riparian habitats during some part of their life cycle (Stewart 1998). Although such areas comprise less than 9 percent of the total BLM land base, they are the most productive and highly prized resources found on BLM lands (Bridges et al. 1998).

Wetlands are uncommon in Skull Valley. There are none on the proposed or alternative PFSF site (PFS/ER 2000) or along the Skunk Ridge transportation corridor. Some wetlands are found near Skull Valley Road in the northern part of Skull Valley. The area in this part of Skull Valley, identified by BLM as the Horseshoe Springs Wildlife Habitat Area (WHA), consists of 25,611 ha (63,286 acres), of which BLM manages almost 85 percent (BLM 1992a) (see Figure 1.2). This area provides crucial habitat for many species of wildlife, as it supplies the only major water source in Skull Valley for miles around and, thus, attracts a large variety of wild animals.

Of the wetlands in the WHA, the most obvious and largest one is the 308-ha (760-acre) area surrounding Horseshoe Springs, which has been designated an Area of Critical Environmental Concern (ACEC) by BLM (BLM 1990). An ACEC designation protects and recognizes the unique, environmentally sensitive, wetlands and springs within that region. Horseshoe Springs is located approximately 24 km (15 miles) north of the proposed facility site, 335 m (1,100 ft) west of Skull Valley Road, 11 km (7 miles) from the rail corridor, and nearly 16 km (10 miles) from the proposed ITF near Timpie. Other, smaller springs also occur to the north and south of Horseshoe Springs (see Figure 3.8), but only Horseshoe Springs supports fish and snails (BLM 1992a).

These wetlands are used by many wildlife species such as falcons, hawks, owls, gulls, shorebirds [e.g., willets (*Catoptrophorus semipalmatus*), American avocets (*Recurvirostra americana*), and black-necked stilts (*Himantopus mexicanus*)], wading birds (e.g., herons, ibises), ducks, swallows, muskrats (*Ondatra zibethicus*), and various amphibians and fish species. Mink also use northern portions of Skull Valley along Skull Valley Road (UDWR 1997a).

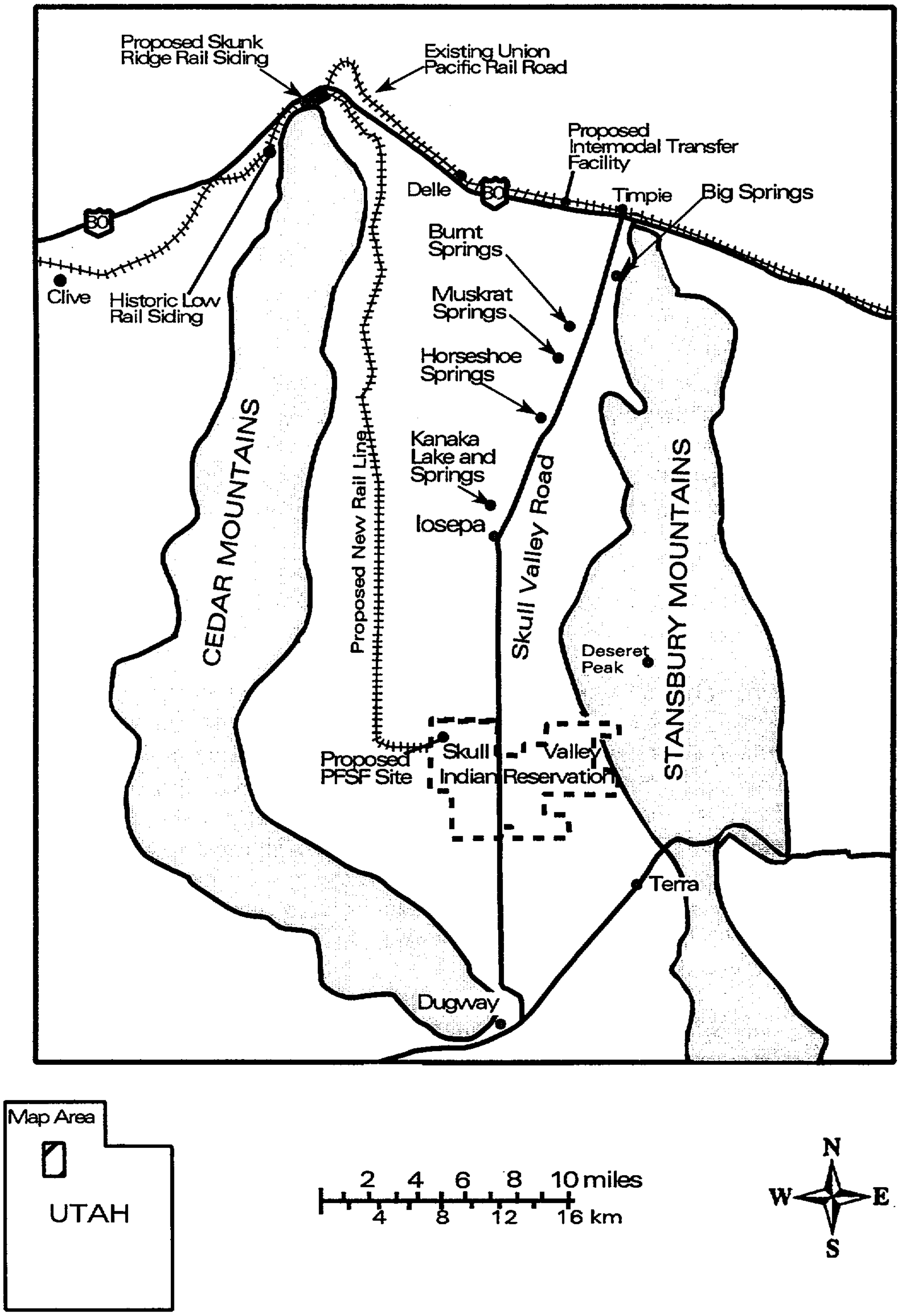


Figure 3.8. Location of major springs in Skull Valley. 1

3.4.3 Threatened, Endangered, and Other Species of Special Concern

Table 3.4 lists all species of special concern known to be on or in the vicinity of the proposed PFSF site or along the transportation corridors in Skull Valley. This list is also applicable to Site B in Skull Valley. Consultation with the FWS has been initiated to comply with Section 7 of the Endangered Species Act (see Appendix B).

3.4.3.1 Plants

No Federal listed threatened, endangered, proposed, or candidate plant species are known to or likely to occur in Skull Valley. The FWS identified Ute Ladies'-tresses (*Spiranthes diluvialis*), a Federally listed threatened species, as a species that may occur in the area of the proposed action. (See Appendix B, letter dated June 22, 1999, from Reed E. Harris, FWS, to Mark Delligatti, NRC). It is found only in moist soils, in moist or wet meadows, and near springs, lakes, or perennial streams. A population of the species was last collected from Tooele County in 1956 at Willow Springs near the town of Callao (57 Fed. Reg. 2048, Jan 17, 1992). Recent searches for the species in the Great Basin have failed to rediscover this historic population or any new populations. Since appropriate habitat for this species is not found in the area of the proposed action, it is unlikely to occur there. One BLM special status plant, Pohl's milkvetch (*Astragalus lentiginosus* var. *pohlii*), and one plant species that is of State conservation concern, small spring parsley (*Cymopterus acaulis* var. *parvus*) could occur there.

Special status plants are those plants found on public lands administered by BLM whose survival is of concern due to their limited distribution, low number of individuals or populations, or potential threats to habitat (BLM 1999b). BLM uses the term "special status plants" to include Federal endangered, threatened, proposed, and candidate species; State endangered, threatened, and rare species; and BLM sensitive plants. Sensitive plants are those species that do not occur on Federal or State lists, but are designated by the BLM State Director for special management consideration. BLM manages the conservation of special status plants and their associated habitats to ensure that actions it authorizes, funds, or carries out do not contribute to the need to list any species as threatened or endangered. The Utah State BLM Office maintains a list of all known and suspected special status plants on BLM lands.

A rare plant field survey was conducted in 1998 in Skull Valley in the area of the proposed PFSF (Kass 1998a, 1998b). Of the plant species that were suggested as potentially occurring within the proposed action area, only Pohl's milkvetch was found. Approximately six plants were discovered about 2.5 km (1.5 miles) southeast of the OCA for Site A on an abandoned road to Hickman Knolls, about 1 km (0.6 mile) southwest of Skull Valley Road. None were found on the proposed PFSF site or rail line. The six Pohl's milkvetch plants are located about 3.7 km (2.3 miles) from the center of the proposed storage pad area at Site A. Another Pohl's milkvetch plant was located in the same general area, but closer to Skull Valley Road.

Pohl's milkvetch, which occurs in greasewood communities at elevations of 1,330 to 1,650 m (4,364 to 5,414 ft) (Welsh et al. 1987), was formerly a Federal Category 2 candidate species (i.e., a species that was considered rare but for which the FWS did not have sufficient data available to support a proposed rule to list it as threatened or endangered). Although numerous varieties of this species are known to occur in Utah (Welsh et al. 1987), this variety is endemic to Rush and Skull

Table 3.4. Skull Valley Federal and State species of special concern expected to use or be present at or near the proposed PFSF site or alternate Site B or along the Skunk Ridge rail corridor

Common name	Scientific name	State status[a]	Federal status[a]
Plants			
Pohl's milkvetch	*Astragalus lentiginosus* var. *pohlii*	UDWRS1, CC	BLM2
Mammals			
Kit fox	*Vulpes macrotis*	—	BLM1
Skull Valley pocket gopher	*Thomomys bottae robustus*	CC	BLM1
Birds [present year-round, except as noted by (s) or (w)]			
Swainson's hawk (s)	*Buteo swainsoni*	SS	BLM1
Burrowing owl	*Asio flammeus*	SS	BLM1
Ferruginous hawk	*Buteo regalis*	ST	BLM1
Peregrine falcon	*Falco peregrinus*	SE	NL
Burrowing owl (s)	*Athene cunicularia*	SS	BLM1
Loggerhead shrike (s)	*Lanius ludovicianus*	—	BLM1
Bald eagle (w)	*Haliaeetus leucocephalus*	SE	FT
Turkey vulture (s)	*Cathartes aura*	Int	BLM Int
Golden eagle	*Aquila chrysaetos*	Int	BLM Int
Northern harrier	*Circus cyaneus*	Int	BLM Int
Red-tailed hawk	*Buteo jamaicensus*	Int	BLM Int
Rough-legged hawk (w)	*Buteo lagopus*	Int	BLM Int
Kestrel	*Falco sparverius*	Int	BLM Int
Prairie falcon	*Falco mexicanus*	Int	BLM Int
Great-horned owl	*Bubo virginainus*	Int	BLM Int
Long billed curlew	*Numenius americanus*	SS	BLM1
Short-eared owl	*Asio flammeus*	SS	BLM1
Amphibian			
Great Basin spadefoot toad[b]	*Spea intermontanus*	P	NL

[a]SE = State Endangered; ST = State Threatened; SS = State Sensitive; S1 = State Rank, typically 5 or fewer occurrences, rarity makes it vulnerable to extirpation; CC = Conservation Concern; s = summer; w = winter; BLM1 = Sensitive; BLM2 = potential; Int = State species of interest; BLM Int = BLM species of interest; P = State protected; NL = not Federally listed; FT = Federal threatened.

[b]Not expected to occur in the PFSF site but could potentially be present along the proposed Skunk Ridge rail corridor.

Sources: Utah Division of Wildlife Resources, Biological Assessment, 3/27/97; Utah State Sensitive Species List, 3/97; Letters from Reed Harris of Fish and Wildlife Service, 7/31/98 and 6/22/99; and Survey for the Site and Low Corridor, 7/30/98; Letter from John Kimball of Utah Division of Wildlife Resources, 1/6/99; PFS/ER 2000; Letter from Ron Bolander of BLM, 4/1/99; Letter from G. William Lamb, 6/30/98.

Valleys and is considered rare in the State (i.e., it has a known or suspected rangewide viability concern) (UDWR 1997b).

Small spring parsley, another species that was suggested as potentially occurring within the proposed action area, grows in desert shrub, sagebrush, and juniper communities at 1,400 to 1,585 m (4,593 to 5,200 ft) in Millard and Tooele counties (Welsh et al. 1987). Neither the plant itself nor suitable habitat for it was found in the area surveyed in Skull Valley (Kass 1998a, 1998b). Also, there are no records of it ever being located in the project area.

3.4.3.2 Wildlife

State and Federally listed wildlife species that are expected to use or be present at or near the proposed PFSF site or in habitats along the proposed Skunk Ridge rail corridor, are listed in Table 3.4. This is also applicable to Site B. This table includes species that are listed by the FWS, the BLM, or the State of Utah. Other listed species discussed below have been mentioned by State or Federal agencies as potentially being in the area of the proposed site or in Skull Valley.

Federal threatened. Bald eagles (*Haliaeetus leucocephalus*) are Federally threatened and listed by Utah State as endangered. These birds are Federally protected under both the Endangered Species Act of 1973 and the Bald and Golden Eagle Protection Act that was most recently updated in 1998. The bald eagle has also been proposed to be removed from the Federal endangered and threatened species list (64 Fed. Reg. 36454, July 6, 1999). Bald eagles winter in the Rush Valley near Rush Lake, over 20 miles east of Skull Valley. During winter, bald eagles hunt in Skull Valley with roosting sites not far from the Reservation (see Figure 3.9). There are only four known bald eagle nest sites in Utah. The closest of these nest locations is on the Jordan River, over 70 miles east of Skull Valley (UDWR 1997a).

State endangered. Peregrine falcons (*Falco peregrinus*) have been removed from the Federal endangered species list (64 Fed. Reg. 46542, Aug. 25, 1999), but they are Utah-State listed as endangered. There is a known peregrine nest site in the Timpie Springs Waterfowl Management Area, approximately 25 miles north of the proposed PFSF site and a few miles to the east of the ITF near Timpie. While the Skunk Ridge corridor and the proposed PFSF site do not include appropriate nesting habitat, peregrine falcons may use these areas for feeding (Stone & Webster 1998; PFS/ER 2000).

State threatened. The ferruginous hawk (*Buteo regalis*) is Utah-State-listed as threatened. This hawk is a year-round resident of Skull Valley. It is known to nest in the foothills of the Cedar Mountains, west of the proposed PFSF site, and within the proposed Skunk Ridge rail line corridor. It nests on rock outcrops and cliffs and forages widely in valleys (UDWR 1997b). Ferruginous hawks have been sighted frequently near the proposed PFSF site and probably use the area for hunting.

State-listed species on tribal trust lands are not protected by state law; however, the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act do apply.

Federal candidate species. The mountain plover (*Charadrius montanus*) is a Federal candidate species. This neotropical migrant nests in upland grass and shrub habitats such as those present at the proposed PFSF site and which are frequently associated with prairie dog colonies. A small

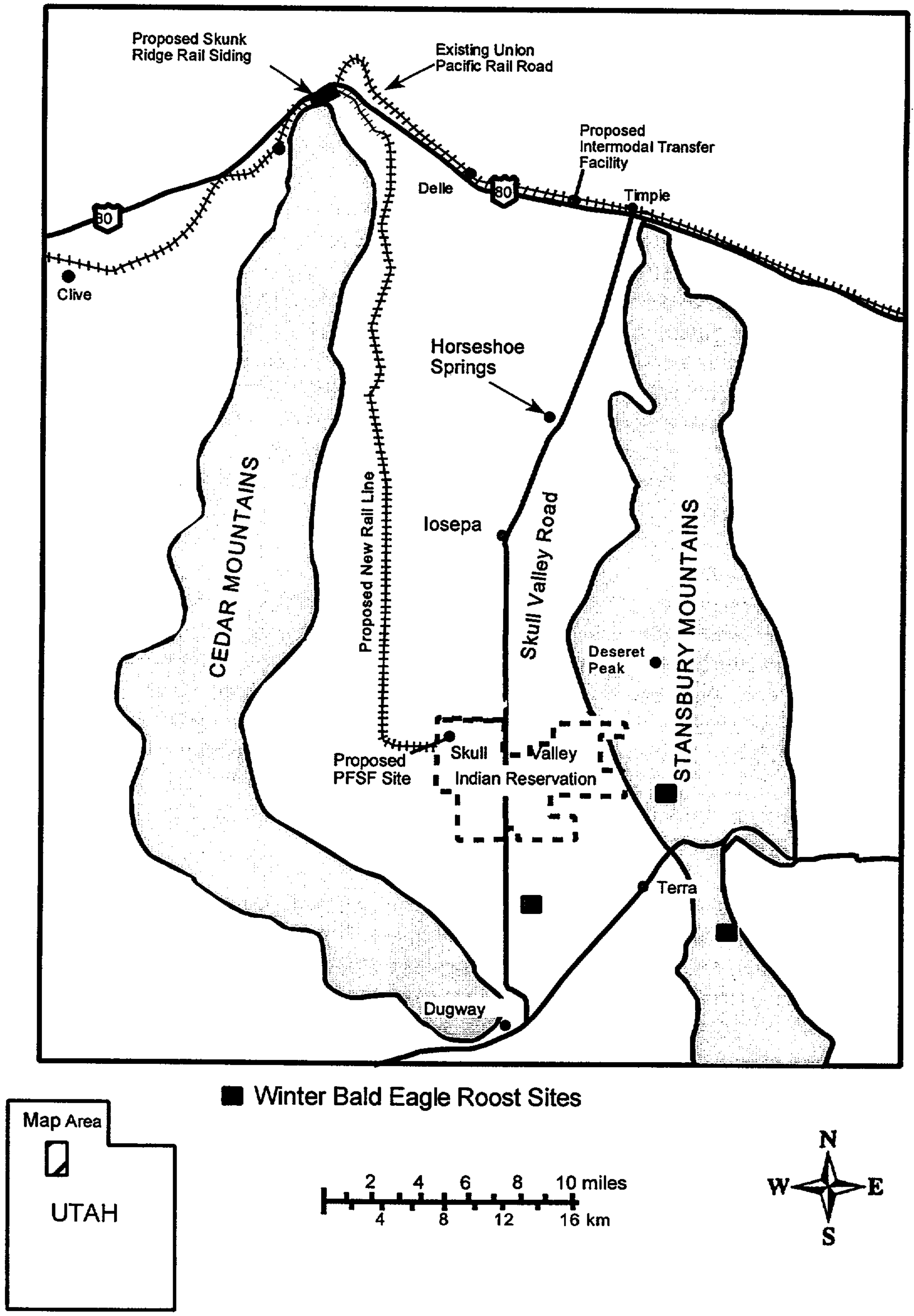


Figure 3.9. Winter roost sites for bald eagles in Skull Valley. 1

population of plovers is known to nest in the Uinta Basin, over 160 km (100 miles) east of Skull Valley (UDWR 1997b). There are no known populations of mountain plovers in Skull Valley and according to the UDWR, the mountain plover is not a concern because it is unlikely to occur in Skull Valley (PFS/ER 2000).

Conservation agreement species. A conservation agreement species is one which the State of Utah has identified as part of its goal to ensure the long-term conservation of the species within its historic range and assist in the development of statewide and rangewide conservation efforts (UDNR 1997; UDNR 1998). One such species is the least chub (*Iotichthys plegethontis*). This chub is in the minnow family (*Cyprinidae*) and occurs in springs, marshes, and stream habitats. Typically, it prefers the same habitats (i.e., shallow water wetlands of the west desert areas of Utah) as those inhabited by spotted frogs [*Rana (pretiosa) luteiventris*] (UDNR 1997). This chub was proposed to be listed as endangered but this proposal was withdrawn (64 Fed. Reg. 41062, July 29, 1999). Implementation of protective measures documented in the Conservation Agreement from 1997 has greatly reduced the possibility of the chub becoming endangered in the foreseeable future. The closest least chub populations to the project PFSF site are over 80 km (50 miles) to the southeast of the proposed action location (UDNR 1997).

The spotted frog is also a State conservation agreement species. This frog has been a Federal candidate species and recently, as a result of implementing protective measures documented in the Conservation Agreement of 1998 for the species, the threat of this species becoming endangered in the foreseeable future has been substantially reduced (63 Fed. Reg. 16218, April 2, 1998). The spotted frog occurs in the west desert areas of Utah in wetlands with small, clear, and cold-water habitats where shallow water is present with an abundance of herbaceous emergent vegetation (UDWR 1997b). Habitat for this species may be present in some of the wetlands along Skull Valley Road (e.g., Horseshoe Springs). However, the Conservation Agreement for the spotted frog does not list any populations in Skull Valley. Utah Lake (45 to 50 miles to the east) is the closest known site for the spotted frog (UDNR 1998).

Sensitive species. Two State sensitive bats have been mentioned by the State of Utah as potentially occurring in the area of the proposed project; the Townsend's big-eared bat [*Corynorhinus (Plecotus) townsendii*] and the Brazilian free-tailed bat (*Tadarida brasiliensis*) (UDWR 1999). Both of these species rely on caves or abandoned mines for their colonies or their communal roosts (UDWR 1997a, UDWR 1997b). These bats are not expected to use the site. However, the Townsend's big-eared bat has been identified in the Chokeberry Springs area of the Stansbury Mountains, approximately 10 miles to the northeast of the proposed PFSF site. While not expected, it is possible that these bats could occasionally feed on the proposed PFSF site, but because there are no abandoned mines or caves in the area, that would be the extent of their activity (PFS/ER 2000).

The desert kangaroo rat (*Dipodomys deserti*) (a BLM sensitive species) and a close relative, the Merriams kangaroo rat (*Dipodomys merriami*), use desert shrub habitats similar to those present in Skull Valley. However, UDWR states that both species are restricted in Utah to only Washington County, in the extreme southwestern part of the State (UDWR 1997b). The Skull Valley pocket gopher (*Thomomys bottae robustus*) and kit fox (*Vulpes macrotis*) are listed as sensitive by BLM (Table 3.4). The gopher prefers soft loamy soils to dig mounded burrows (Stone & Webster 1998). Habitat for this species is present at the proposed PFSF site, along Skull Valley Road, and along the Skunk Ridge railroad corridor; however, a 1998 wildlife survey found no evidence of the Skull Valley pocket gopher along the Skunk Ridge rail corridor or at the ITF site. Also, 1996 and 1997 observations of the PFSF found no evidence of the Skull Valley pocket gopher (PFS/ER 2000). The kit fox is a BLM sensitive species and occurs in Skull Valley (BLM 1998; Burt and Grossenheider 1976). It prefers habitats that are open and contain sandy ground and low desert vegetation (Burt and Grossenheider 1976).The preferred prey species for kit fox are rabbits and desert rodents such as ground squirrels, rats, and mice (Whitaker 1980), which are common on the proposed PFSF site. Habitat is present for this fox along Skull Valley Road and the Skunk Ridge railroad corridor, and the proposed PFSF site itself; however, a 1998 wildlife survey found no evidence of the kit fox along the Skunk Ridge rail line corridor or at the ITF (PFS/ER 2000). Another State sensitive mammal is the ringtail (*Bassariscus astutus*). The ringtail is not expected at the proposed PFSF site or along the Skunk Ridge Corridor, as it is dependent on having water nearby (UDWR 1997b). The ringtail could use the springs to the north of the project site, along Skull Valley Road.

The white-faced ibis (*Plegadis chihi*) and snowy plover (*Charadrius alexandrius*) are listed by BLM as sensitive species. BLM has indicated that these species should be expected to use the Horseshoe Springs wetland area (BLM 1997). Therefore, these birds are not expected to use the site or rail corridor. The State and BLM sensitive long-billed curlew (*Numenius americanus*) is thought to nest in the Horseshoe Springs area and along the proposed Skunk Ridge rail corridor (PFS/ER 2000). This shorebird nests in the upland meadows and rangelands of northern and central Utah valleys and forages in moist meadow wetlands and upland habitats (UDWR 1997a and 1997b).

The sage grouse (*Centrocerus urophasianus*) is a native game species. The sage grouse has declined approximately 50 percent since 1967, and because of this decline, it is listed as a sensitive species by the BLM and the State of Utah (UDWR 1999; UDWR 1997a and 1997b). Sage grouse breeding grounds, called leks, are usually associated with wet meadows. Use areas have been identified north and northeast of the proposed PFSF site along Skull Valley Road and in the foothills of the Stansbury Mountains. The closest use area to the Reservation appears to be approximately 16 km (10 miles) to the northeast (UDWR 1997a), therefore, the sage grouse is not expected to be present at the site or along the rail corridor.

The Utah milk snake (*Lampropeltris triangulum taylori*) was mentioned as possibly being in the area of the site by UDWR (UDWR 1999). However, it is not expected to use the project site or the Skunk Ridge rail corridor area, because it occurs in wooded mountain areas.

Other species of special concern. Raptors are a group of birds that the State of Utah and BLM consider to be species of interest. Hawks, falcons, owls, and eagles are protected under the Utah State Code. Disturbance that results in the abandonment of a raptor nest is an unlawful take and is in violation of Utah Code 23-13-2 (43). In addition to the species discussed previously (i.e., bald eagle, peregrine falcon, and ferruginous hawk), turkey vulture; golden eagle; swainson's, rough-legged, and red-tailed hawks; prairie falcon; kestrel; northern harrier; and burrowing, short-eared, and great-horned owls are listed as either high interest or sensitive with the State of Utah and BLM. The golden eagle has added protection under the Bald and Golden Eagle Protection Act and its recent amendments of 1998. All of these species could use the proposed PFSF site, areas along Skull Valley Road, and the Skunk Ridge railroad corridor for feeding areas. The only exception might be the short-eared owl, which would be more likely to use marsh and wetland areas to the north, such as Horseshoe Springs. Nesting sites have been identified for Swainson's and red-tailed hawk along Skull Valley Road. Burrowing short-eared owl nest burrows have been located along the proposed Skunk Ridge railroad corridor. Pairs of northern harriers have been noted along the proposed Skunk Ridge railroad corridor, which indicates they may also breed in these areas (Stone & Webster 1998).

Sandhill cranes (*Grus canadensis*) are State of Utah conservation concern species that may occur in Skull Valley. Cranes use prairies, grasslands, fields, wetlands, and marsh areas (UDWR 1999; Chandler et al. 1983; National Geographic Society 1983) and are not expected to occur at the proposed PFSF site or along the proposed Skunk Ridge rail corridor.

Other birds mentioned by State and Federal agencies as potentially using the proposed PFSF site and Skull Valley area include the bobolink (*Dolichonyx oryzivoris*), common yellowthroat (*Geothlypis trichas*), Caspian tern (*Sterna caspia*), American white pelican (*Pelecanus erythrorhynchos*), Lewis' woodpecker (*Melanerpes*), and loggerhead shrike. Bobolinks use flooded grasslands and wet meadows in Skull Valley (e.g., wetland areas north of the proposed PFSF site, along Skull Valley Road). Common yellowthroats also use these wetlands (UDWR 1997b; UDWR 1999). Therefore, neither of these birds are expected to use areas associated with the proposed PFSF site. Caspian terns and American white pelicans would not be expected to use the proposed PFSF site or any transportation corridors (i.e., rail corridor or ITF). These birds nest on islands in the Great Salt Lake and then use freshwater wetlands for foraging (UDWR 1997b). Lewis' woodpecker prefers open wooded areas and is not expected to use areas associated with the project. This woodpecker is a resident of the riparian habitats of the Uinta Basin, over 100 miles east of Skull Valley (UDWR 1997b). The loggerhead shrike is a species known to nest in the saline lowlands of Skull Valley. Shrikes have been observed on the proposed PFSF site as well as along the Skunk Ridge corridor, and could be expected to occur along Skull Valley Road (Stone & Webster 1998).

Speckled dace (*Rhinichthys osculus*), mink (*Mustela vison*), and Great Basin spadefoot toad are State protected species (UDWR 1997a). According to UDWR, speckled dace and mink use wetland areas along Skull Valley Road, to the north of the proposed PFSF site and are not expected to use areas associated with the proposed PFSF site. The Great Basin spadefoot toad has been identified to the south of the proposed PFS site and could be present in certain seasonal drainages that occur along the Skunk Ridge railroad corridor (Stone & Webster 1998; UDWR 1997a).

A State listed high interest snail is known to exist in wetlands more than ten miles south of the proposed PFSF site. The snail, swamp lymnaea (*Lymnaea stagnalis*), could occur in wetlands along Skull Valley Road but is not expected to use areas associated with the proposed PFSF site (UDWR 1997a; Stone & Webster 1998).

3.5 Socioeconomic and Community Resources

This section describes such socioeconomic characteristics and community resources as population, employment, and housing. It discusses the availability of services (such as schooling and housing) in those surrounding communities that would be likely to attract any temporary or permanent work force. The socioeconomic conditions of the Skull Valley Band are discussed first, followed by a discussion of the socioeconomic conditions in areas surrounding the Reservation.

The proposed PFSF site and the alternative site are in the northwest section of the Reservation. The Reservation, itself, consisting of approximately 7,530 ha (18,600 acres), is situated in the east-central portion of Tooele County. The Skull Valley Road travels north-south through the Reservation, connecting to Interstate 80, which travels east into Salt Lake City.

3.5.1 The Reservation

The Reservation is located in a remote area approximately 56 km (35 miles) south of the Great Salt Lake. The Reservation is in a semi-arid valley, and a portion of the Wasatch-Cache National Forest borders the Reservation on the east. Reservation land is suitable for grazing. About 65 ha (160 acres) of Reservation land are irrigable. Stream water is delivered to the irrigable lands through an existing pipeline.

The Skull Valley Band is culturally and economically similar to the Western Shoshone and speaks Shoshone. The Skull Valley Band has an enrollment of approximately 120, with about 30 members of the Skull Valley Band residing on the Reservation. The majority of these members are under the age of eighteen. The balance of the enrollment resides in outlying areas within the State of Utah or out-of-state. Two adult Skull Valley Band members from the Reservation are students; one member is an elected Tribal official, and other adult members are employed off the Reservation in nearby communities working with the agriculture, forestry, and fisheries classes of industry (PFS/RAI1 1999).

The majority of the Skull Valley Band members that do not reside on the Reservation are employed in Salt Lake City, Grantsville, Stockton, Tooele, and Ibapah. These members are employed in various positions including artisans, nurses, and construction workers. Several of the enrolled membership living off the Reservation have expressed interest in returning to the Reservation if jobs and housing were available (PFS/RAI1 1999).

The household income of the Skull Valley Band members living on the Reservation is approximately $20,000 per year (PFS/RAI1 1999). About 17 individuals are noted as members of households having income below the national poverty level (includes individuals living on the Reservation who are not Skull Valley Band members, such as spouses (PFS/RAI1 1999).

The school-age children on the Reservation attend classes at the school located in the Town of Dugway (PFS/ER 2000). Approximately 10 percent of the enrolled membership have 2 or 4-year degrees from post-secondary educational institutions. The Skull Valley Band has an ongoing tuition assistance program that has limited capability due to limited financial resources (PFS/RAI1 1999).

Health care is provided by the Indian Health Service Uintah and Ouray Service Unit in Fort Duchesne, 510 km (320 miles) from the Reservation. Hospital care is provided through the Indian Health Service Contract Health Program in Tooele. The Indian Health Service has not provided data requested to characterize the health status of the Skull Valley Band.

The Skull Valley Band has no natural resources other than the land itself, and has pursued economic development projects that are consistent with the numerous waste processing and testing facilities that surround the Reservation. Until 1995, about 90 percent of their income to fund programs came from the lease of the Tekoi Rocket Testing Facility on the Reservation. This lease has recently expired and has not been renewed.

Through an annual budgeting process, the Skull Valley Band allocates all financial resources for the betterment of their living conditions (PFS/RAI1 1999). Many of the activities conducted on the Reservation, including maintenance and operation of the Pony Express Convenience Store, which sells convenience groceries and gasoline to Skull Valley Band members and passers by on Skull Valley Road, and the operation of Tribal governance, are currently staffed with volunteer positions due to the lack of financial resources. Three volunteer staff members, including one Skull Valley Band member from the Reservation, one individual married to a Skull Valley Band member, and one person who is not a member of the Skull Valley Band, operate the store. Income derived from the store is deposited into the Tribal general account (PFS/ER 2000). Tribal government is in the process of developing financial strategies to provide for the long-term financial security and improvement in the standard of living for enrolled Skull Valley Band members from their business ventures (PFS/RAI1 1999).

Utility infrastructure on the Reservation is limited. Included are a community building, storage shed, water shed, water tank, and a small reservoir. The types of utilities available include Skull Valley Band water (three drilled wells), individual septic systems, electricity provided by Utah Power, telephone service, and propane provided by Amerigas (PFS/ER 2000).

The Skull Valley Road passes through the Reservation approximately 2.4 km (1.5 miles) from the proposed PFSF site (see Figure 2.1). Traffic on this roadway is primarily related to local resident travel and travel between Interstate 80 and the Dugway Proving Ground. Average daily traffic on Skull Valley Road past the Reservation in 1995 was approximately 325 vehicles per day (Utah Department of Transportation 1995).

3.5.2 Tooele County and Communities

3.5.2.1 Land Use

The principal land uses in Skull Valley are rangeland for livestock grazing (agriculture) and recreation. For both of these activities, much of the land used for these purposes is administered by the BLM. Much of the remainder of the land is split almost evenly between the Reservation and private ownership, with some land owned by the State of Utah. The following discussion describes land ownership and land use for the impact area.

Many areas of Tooele County are undeveloped and somewhat isolated. Most land in the County is under the administration of the BLM and the military (including Dugway Proving Grounds, the Utah Test and Training Range, and Tooele Army Depot and Deseret Chemical Depot), and a significant portion of the county is actively used for hazardous waste incineration and storage (at the USPCI, Aptus, and Envirocare facilities) (see Figure 1.1). The Dugway Proving Grounds includes about 340,000 ha (840,000 acres), with its nearest border about 24 km (15 miles) southwest of the proposed PFSF site. It is a U.S. Army multipurpose facility that tests chemical and biological defense systems. Skull Valley is within the Utah Test and Training Range which includes 19,000 square miles (about 12 million acres) of restricted airspace in northern Utah. Mineral extraction interests are active near the Great Salt Lake and in the mountainous areas of the county. The military and hazardous waste industries have located in the county from throughout the nation, as have mineral extraction interests (Gillies Stransky Brems Smith Architects 1995).

Table 3.5 shows the percentage of Tooele County that has been farmland since 1982. Although the county is not heavily agricultural (i.e., much of the county is administered by Federal agencies) and the proportion of land dedicated to farming has declined over the last fifteen years, agriculture still plays an important role in the local economy (see Section 3.5.2.3). To put the agricultural character of the county in perspective, approximately 42 percent of U.S. land overall is in farms compared with 6.6 percent in Tooele County (U.S. Dept. of Agriculture 1999).

Table 3.5. Land in farms in the socioeconomic impact area

	1982	1987	1992	1997
	Hectares (acres)	**Hectares (acres)**	**Hectares (acres)**	**Hectares (acres)**
Total land area	1,799,000 (4,445,400)	1,799,000 (4,445,400)	1,799,000 (4,445,400)	1,799,000 (4,445,400)
Land in farms	204,642 (505,681)	197,255 (487,427)	176,944 (437,238)	117,862 (291,238)
Percent of total land area that is farmland	11.4	11.0	9.8	6.6

Sources: U.S. Bureau of the Census 1992. *1992 Census of Agriculture* and the U.S. Department of Agriculture 1999. *1997 Census of Agriculture*

Land ownership and administration within Skull Valley includes the Reservation, the Dugway Proving Ground (military), Wasatch-Cache National Forest, the BLM, the State of Utah [approximately 10,120 ha (25,000 acres)], and privately owned ranches and residential areas. The privately owned ranches consist of about 28,328 ha (70,000 acres), and the Reservation is approximately 7,530 ha (18,600 acres). Most of the land in Skull Valley is administered by the BLM, which leases much of its land for grazing.

With the exception of the Reservation and other lands under the domain of Federal agencies, land in Skull Valley is controlled by Tooele County zoning. The Tooele County General Plan (Gillies Stransky Brems Smith Architects 1995) defines six planning districts: Tooele Valley, Rush Valley, West Desert, I-80 Corridor, Ibapah-Gold Hill, and Skull Valley.

The Skull Valley planning district stretches from its northeast corner just south of Timpie to the southern border of Tooele County. Within this area, most of the land is zoned as "multi-use." However, along the Skull Valley Road there are significant land areas zoned as "agricultural" which requires a minimum lot size of 16.2 ha (40 acres). Permitted uses in Multiple Use and Agricultural Districts include agricultural uses, construction of single and two-family homes, recreation facilities and storage of agricultural equipment. The Wasatch-Cache National Forest is a significant part of the Planning District and starts about 8 km (5 miles) to the east of the Skull Valley Road, extending southward for about 32 km (20 miles) and ending just north of Highway 199.

Within an 8-km (5-mile) radius of the proposed PFSF, there are approximately 5,263 ha (13,000 acres) of Reservation land, 3,644 ha (9,000 acres) of privately owned land, and 11,336 ha

(28,000 acres) of public land administered by the BLM (PFS/ER 2000). The Skull Valley Band village and two private ranches are within this radius. Two private ranches, on Skull Valley Road, are approximately 4.8 km (3 miles) and 6.4 km (4 miles) northeast of the proposed PFSF (PFS/ER 2000). Cattle grazing on a small part of the Reservation is a future possibility (PFS/RAI1 1999).

The BLM land within the 8 km (5 miles) radius is part of the Skull Valley and South Skull Valley grazing allotments and includes three pastures (West Cedar, Eightmile, and Black Knoll). The southeast corner of the Black Knoll Pasture is within the 8 km (5 miles) radius. Two operators are authorized to graze up to 5,000 sheep and 2,300 cattle within the Skull Valley allotment from November 1 to April 30. Sheep graze in alternate years. Cattle graze following a 3-year cycle: in year one they graze from November 1 to April 30; in year two they graze from November 1 to February 28; and in year three they graze from April 1 to April 30. The potential rail line from Skunk Ridge to the proposed PFSF would cross the Eightmile and Black Knoll Pastures. Portions of two pastures in the South Skull Valley allotment are within the 8 km (5 miles) radius of the site: the east end of the Cochrane Pasture and the north edge of the Post Hollow Pasture. The permit holder for these pastures is authorized to graze a maximum of 700 cattle and 3,800 sheep from November 1 to April 30 in alternating years (PFS/ER 2000).

In summary, the Skull Valley area in general and the area surrounding the proposed PFSF is characterized by open space and is generally undeveloped with mostly limited grazing and agricultural uses. The opportunity for expansion of existing uses in the valley is limited due to the lack of accessible private land in the valley or along the Skull Valley Road corridor. In addition, because of the valley's limited population, services, and infrastructure, significant future growth in commercial or industrial uses seems unlikely (Gillies Stransky Brems Smith Architects 1995).

3.5.2.2 Population

Aside from the Reservation, which has a residential population of about 30, residential populations in Skull Valley include about 30 households in the unincorporated town of Terra and 11 households in the rest of the valley. Assuming a persons per household value of 2.87 (Governor's Office of Planning and Budget 1997), this represents a total non-Reservation population of approximately 120 persons within Skull Valley; combining Reservation and non-Reservation populations results in a total of approximately 150 persons within Skull Valley. The households in Terra are primarily due to employment at the Dugway Proving Ground and the remaining residences are related to ranching and agricultural activities. The Town of Dugway, with a population of about 1,800 (PFS/ER 2000), is just outside the Skull Valley Planning District; however, Dugway's on-site residences and employment are important sources of traffic on Skull Valley Road.

Tooele County's population is approximately 33,351 (1998), and approximately 16,748 people live in its largest city, Tooele (1998). The county's average annual growth rate of approximately 2.9 percent through the 1990s is higher than the State's average of 2.1 percent. By 2020, the population is projected to surpass 59,000. Tooele County has the second largest land area in the State, but a relatively low density of 4.8 people per square mile estimated in 1998 (Governor's Office of Planning and Budget, Demographic and Economic Analysis, http://www.governor.state.ut.us/dea/rankings/county/densitygh.htm), as compared with a density of approximately 25.4 persons per square mile estimated in 1998 for the State as a whole (Governor's Office of Planning and Budget, Demographic and Economic Analysis, http://www.governor.state.ut.us/dea/rankings/county/popgh.htm).

Table 3.6 shows current populations and recent changes in population for Tooele County and incorporated areas within Tooele County. No official population counts are available for the Skull Valley portion of Tooele County itself. Table 3.7 provides additional historical data regarding population in Tooele County. Projections of future population for Tooele County and incorporated areas within Tooele County are provided in Table 3.8.

No transient or institutional populations are present within 8 km (5 miles) of the proposed PFSF. During October 1996, a survey was conducted to identify existing and planned public facilities and institutions within an 8 km (5 miles) radius of the facility. Due to the remoteness and extreme low population density of the area [36 persons within an 8 km (5 miles) radius of the proposed PFSF], no public facilities such as hospitals, prisons, parks or recreational areas are located or planned within that radius (PFS/ER 2000).

3.5.2.3 Employment and Economic Resources

This section describes the local economy and presents the relevant unemployment statistics for the area. The nature of the local workforce is also presented in light of the need for workers at the proposed PFSF.

Tooele County's 1995 per capita income was approximately $14,800. This is lower than the State average of $18,226. The county's 1996 unemployment rate, at 5.3 percent, was higher than the State's 3.5 percent that same year.

As of 1996, there were approximately 10,650 employees in the Tooele County labor force. As demonstrated in Table 3.9, total employment in Tooele County has remained fairly stable over the last 15 years, as has the unemployment rate.

As demonstrated in Table 3.10, government provides more jobs, by far, than any other source of employment in the county, although the proportion of government jobs to total jobs has declined substantially over the last 15 years. The major employers for Tooele County, as of 1996, were Tooele Army Depot (1,000 to 1,999 employees), the Tooele County School District (700 to 999 employees), Dugway Proving Grounds (500–699 employees), Magnesium Corporation of America (MagCorp; see Figure 1.1) (500–699 employees), and EG&G Defense Materials, Inc., an Army contractor operating at Deseret Chemical Depot (500–699 employees) (Governor's Office of Planning and Budget, Demographic and Economic Analysis, 1999, http://www.qget.state.ut.us/county/scripts/County.asp?ID=23). Fairly recently, Tooele County has attracted a substantial amount of development related to waste management, and Tooele County has planned for such development in its Interstate 80 Planning District.

Agriculture in Tooele County in 1997 occurred on 332 farms and covered approximately 117,862 ha (291,238 acres) of land. Important commodities are wheat, barley, hay, and cattle. As discussed in Section 3.5.2.1, much of the land used for grazing purposes derives from allotments from the BLM. Table 3.11 provides information related to agricultural activity in Tooele County.

In summary, the economy of Tooele County consists of several "mini" economies. The more remote, rural areas are resource-based economies that rely on agriculture, ranching, and mineral extraction, while the more developed and populous Tooele Valley is more multi-dimensional with active roles played by manufacturing, retail and wholesale trade, and government sectors (PFS/ER 2000).

Table 3.6. Population in Tooele County and incorporated areas

City	1990	1991	1992	1993	1994	1995	1996	1997	1998
Grantsville	4,500	4,633	4,723	4,821	4,920	4,998	5,198	5,304	5,528
Ophir	25	25	25	26	27	29	30	32	34
Rush Valley	339	347	349	352	357	365	367	369	375
Stockton	426	433	438	444	457	460	467	478	497
Tooele (city)	13,887	14,094	14,274	14,454	14,716	14,830	14,996	15,711	16,748
Vernon	181	185	186	190	197	198	199	198	202
Wendover	1,127	1,122	1,124	1,145	1,167	1,178	1,190	1,216	1,258
Balance of Tooele County	6,116	6,225	6,322	6,536	6,919	7,255	7,649	8,157	8,709
Tooele County Total	26,601	27,064	27,441	27,968	28,760	29,313	30,096	31,465	33,351

Source: U.S. Bureau of the Census, *Subcounty Population Estimates, 1990–1998*. Washington, D.C., July 1999.

Table 3.7. Historical population data for Tooele County

Category	1940	1950	1960	1970	1980	1990
Total population (July 1)	9,133	14,636	17,868	21,545	26,033	26,601
Percent change from previous value	N/A	60.3	22.1	20.6	20.8	2.2

Source: U.S. Bureau of the Census, *Population of Counties by Decennial Census: 1990–1990.*

Table 3.8. Population projections for incorporated areas in Tooele County

Area	1999	2000	2001	2002	2003	2010	2020
Grantsville	6,160	6,459	6,771	7,099	7,324	9,144	11,470
Ophir	33	34	34	35	37	42	54
Rush Valley	406	433	461	491	506	652	751
Stockton	543	567	592	618	637	794	991
Tooele (city)	16,907	17,386	17,879	18,387	18,971	20,452	26,252
Vernon	206	220	234	249	257	294	372
Wendover	1,378	1,363	1,348	1,333	1,375	1,302	1,922
Balance of Tooele County	8,981	8,819	8,658	8,551	8,823	13,794	17,866
Total	34,615	35,280	35,977	36,762	37,931	46,474	59,678

Source: Governor's Office of Planning and Budget—Demographic and Economic Analysis Section, UPED Model System, 1997 Baseline Projections (12/17/96)

Table 3.9. Employment and income for residents of Tooele County

Category	1980	1985	1990	1995	1996
Labor force	11,489	11,697	12,275	11,040	11,243
Employed	10,838	10,991	11,667	10,418	10,651
Unemployed	651	706	608	622	592
Unemployment rate (percent)	5.7	6	5	5.6	5.3
Per capita income	$7,968	$10,966	$13,378	$14,772	N/A

Source: Governor's Office of Planning and Budget, Demographic and Economic Analysis, Historical data: Tooele County (http://www.qget.state.ut.us/county/scripts/County)

Table 3.10. Employment by economic sector in Tooele County

Economic sector	1980	1985	1990	1995	1996
Manufacturing	1,095	1,173	1,008	1,050	1,183
Mining	885	322	229	213	216
Construction	269	322	391	605	669
Transportation, communications and public utilities	247	218	256	1,301	1,694
Trade	962	1,204	1,335	1,599	1,715
Finance, insurance and real estate	167	157	134	171	192
Services	749	996	1,265	1,431	1.572
Government	5,752	6,224	5,939	3,458	3,279
Non-farm proprietors	1,001	1,345	1,505	1,895	2,020
Total employment	11,520	12,355	12,434	12,091	12,918

Source: Governor's Office of Planning and Budget—Demographic and Economic Analysis Section.

UPED Model System 1997 Baseline Projections (12/17/96). The last year of historical data is 1995 for employment and 1996 for population.

Table 3.11. Agricultural activity in Tooele County

	1982	1987	1992	1997
Total land area (acres)[a]	4,445,400	4,445,400	4,445,400	4,445,400
Farms (number)	304	299	300	332
Land in farms (acres)	505,681	487,427	437,238	291,238
Percent of total land area in farms	11.4	11.0	9.8	6.6
Average size of farm (acres)	1,663	1,630	1,457	879
Irrigated land (acres)	21,570	18,972	16,479	18,944

[a]1 acre = 0.40469 ha.

Source: U.S. Department of Agriculture, National Agricultural Statistics Service, 1997 Census of Agriculture.

Natural resources, particularly the lack of water resources, will always serve as a limitation to potential growth in the more remote areas of the county (Gillies Stransky Brems Smith Architects 1995).

3.5.2.4 Community Resources

Information on community resources (including utilities, public services, housing, schools, and transportation) is presented and discussed in this section. Details related to the Reservation are presented first, with the remainder of the discussion in this section describing community resources in the rest of Tooele County.

Utilities. Utility infrastructure in Skull Valley is very limited. In the more populated parts of Tooele County (e.g., Tooele Valley, Rush Valley), there is an established infrastructure that provides potable water, sanitary sewer, natural gas, and electrical service. The entire county is served by electrical power and telephone service; natural gas and cable television are only available in the Tooele Valley area where the population density is higher (PFS/ER 2000).

Drinking water in Tooele County originates from well or spring sources. Most of the incorporated areas and military installations provide central water systems and operate well systems, providing water for potable uses as well as industrial use and fire protection. In the rural areas, individual wells provide potable water for farm and ranch operations and homes. Water use in Skull Valley itself is limited to servicing human consumption needs, limited irrigation for the growth of cattle feedstock crops along Skull Valley Road, and drinking water for the livestock itself over the grazing areas (PFS/RAI1 1999).

The only centralized wastewater systems serving the county are located in Tooele, Grantsville, Lake Point, Stansbury Park, and at the military facilities at Tooele Army Depot and Dugway Proving Grounds. The rest of the county is served by individual septic tank systems. The septic tank systems have worked relatively well, but in areas of shallow groundwater some failures have occurred (PFS/ER 2000).

Electrical power is provided to virtually the entire county. Service is limited in more rural areas and is generally located along public roads. Power lines cross through the county to serve other areas. Telephone service is also available throughout the county, with U.S. West providing service to the eastern, more densely populated party of the county and smaller systems serving more rural areas (PFS/ER 2000).

Natural gas service is provided to the eastern part of the county. In other areas, service is not provided due to the economics required to extend service lines to customers (PFS/ER 2000). However, propane is provided to other areas by Amerigas.

The management and disposal of solid waste has traditionally been provided by the county to all residents. Historically, the county has operated a solid waste landfill where all collected wastes have been deposited. The county has recently closed its old facilities and has developed a new facility for recycling, composting, and conditioning waste that complies with all current regulations (PFS/ER 2000).

Public health and safety. The Tooele County Fire District is a volunteer fire department that provides service in an area extending from Stockton to the Great Salt Lake and from the eastern county line westward to Interstate 80 mile marker 45. When necessary, the department responds to emergencies throughout the remainder of the county (PFS/ER 2000).

Health and emergency services, including the Tooele Regional Medical Center, Home Health and Nursing Home operations, and the Tooele Valley Ambulance Service, are located in Tooele Valley in the incorporated areas of Grantsville, Tooele, and Vernon. The medical center offers surgery, emergency, laboratory, and special medical care and testing (PFS/ER 2000). More extensive health care services are offered in Salt Lake City.

The Tooele County Sheriff's Department responds to accidents and crime throughout the county, while city police departments serve the communities of Tooele, Grantsville, Stockton, and Wendover (PFS/ER 2000).

Housing. Key housing data for Tooele County and incorporated areas in the impact area are provided in Table 3.12. This information, which comes from the 1990 decennial census, is the latest complete set available for the jurisdictions under study. The proportion of housing units occupied by renters varied from a low of approximately one-fifteenth in the towns of Cedar Fort and Rush Valley to 100 percent in Dugway and just over one-half in Wendover. If one discounts Dugway and Wendover as sources of potential housing for the proposed action (because housing in Dugway is restricted to employees of Dugway Proving Grounds and Wendover is relatively far from the proposed site), the incorporated areas with the greatest absolute number and proportion of renter-occupied housing units are Grantsville and Tooele City. The median value of an owner-occupied unit was lowest in Stockton, and the median rent was lowest in Rush Valley. The median value of a home was highest in Rush Valley, and, discounting Dugway (see above), the rent was the highest in Tooele. In all of Tooele County, there were 147 vacant units for sale and 413 units for rent in 1990. Table 3.13 shows substantial growth in residential development in recent years that may indicate greater housing capacity than indicated by the information displayed in Table 3.12.

Education. The Tooele County School District offers education throughout the county. It includes 19 public schools (including schools for students of employees at Tooele Army Depot and Dugway Proving Grounds) as well as an adult education center. As of October 1998, there were approximately 8,170 students enrolled in district schools. Table 3.14 provides information regarding the enrollment at each of the district's schools. The student/teacher ratios for schools in the Tooele County School District average approximately 22.6, with the lowest ratios being found in grades seven and eight (19.6 students per teacher) and the highest being found in sixth grade (25 students per teacher) (Tooele County School District 1999).

During 1998–99, the Tooele County School District added over 76,000 square feet of new classroom space, with a new elementary school in Wendover and twenty new classrooms at East Elementary School and Stansbury Park Elementary School, and a multi-purpose room at Harris Elementary School. These projects were completed as a result of a $10 million bond issue approved by voters in the district in 1996. The Tooele School District projects an increase of more than 40 percent new growth in the next 10 years and, based on this new growth, substantial additional capacity will be required, including a new elementary school in Grantsville, additional elementary schools in Tooele, Stansbury and Erda, an additional middle school and high school in Tooele, Stansbury, and Erda, and additions to the Grantsville high school and middle school (Tooele County School District 1999).

Table 3.12. 1990 housing data for Tooele County and incorporated areas

Location	Number of occupied housing units	Percent of units occupied by owner	Percent of units occupied by renter	Number of vacant housing units	Number of vacant units for sale	Number of vacant units for rent	Median value owner-occupied unit ($)	Monthly median rent ($)
Grantsville	1,376	77.9	22.1	96	18	26	57,600	238
Ophir	13	69.2	30.8	17	0	0	55,000	99
Rush Valley	112	92.9	7.1	25	4	1	61,700	192
Stockton	133	87.2	12.8	15	3	2	43,300	225
Tooele	4,842	74.5	25.5	348	102	113	59,800	289
Vernon	57	87.7	12.3	14	0	2	52,900	213
Wendover	294	45.2	54.8	54	4	43	55,000	246
Tooele County	8,581	70.2	29.8	929	147	413	60,400	292
Cedar Fort	77	93.5	6.5	7	1	1	58,200	175
Dugway	466	0.0	100.0	164	0	163	NA	366

Source: U.S. Bureau of the Census 1991

Table 3.13. Building permits in Tooele County

Category	1980	1985	1990	1995	1996	1997	1998
Residential building permits	107	126	74	271	323	1,013	1,012

Source: Governor's Office of Planning and Budget, Demographic and Economic Analysis, Historical data: Tooele County (http://www.qget.state.ut.us/county/scripts/County).

Transportation. The Skull Valley Road passes through the Reservation approximately 2.4 km (1.5 miles) from the proposed PFSF (see Figure 2.1). Traffic on this roadway is primarily related to local resident travel and travel between Interstate 80 and the Dugway Proving Ground. Table 3.15 provides information related to traffic on roads potentially affected by the proposed action. Table 3.16 provides information depicting monthly and daily variation in traffic on Interstate 80.

3.6 Cultural Resources

3.6.1 Cultural Background

The region of the proposed action is rich in prehistoric and historic Native American and historic period Euro-American cultural resources. Human occupation and use of this part of Utah can be placed into several sequential chronological periods, summarized in Table 3.17. Basic references for the historic period background of Skull Valley and environs include Bluth (1978), Blanthorn (1998), and various chapters in Miller (1990); other references that deal more directly with specific cultural resource projects or individual cultural properties are cited in the following sections.

Table 3.14. Educational resources in the Tooele County School District (Fall 1997)[a]

School	Location	Grades	Number of students
Kindergarten and elementary schools			
Anna Smith Elementary School	Wendover	K–6	264
Dugway Elementary School	Dugway	K–6	154
East Elementary School	Tooele City	K–6	585
Grantsville Elementary School	Grantsville	K–5	758
Ibapah Elementary School	Ibapah	K–6	25
Northlake Elementary School	Tooele City	K–6	755
Stansbury Park Elementary School	Stansbury Park	K–6	673
Sterling R. Harris Elementary School	Tooele City	K–6	527
Vernon Elementary School	Vernon	K–6	29
West Elementary School	Tooele City	K–6	604
Middle and junior high schools			
Grantsville Middle School	Grantsville	6–8	527
Tooele Junior High School	Tooele City	7–8	729
Ibapah Middle School	Ibapah	7–8	8
High schools			
Dugway Junior-Senior High School	Dugway	7–12	151
Grantsville High School	Grantsville	9–12	800
Tooele High School	Tooele City	9–12	1,505
Tooele Valley High Alternative School (home study)	Tooele Army Depot	10–12	103
Wendover Junior-Senior High School	Wendover	7–12	187
Oquirrh Hills School	Tooele City	ungraded	4

[a]There were also 350 students at the Tooele Adult Education Center and 77 students in preschool at Harris Elementary, Grantsville Elementary, and the Oquirrh Hills Early Learning Center enrolled as of October 1, 1998.

Source: Tooele County School District 1999.

Table 3.15. Traffic on highways potentially affected by the proposed action 1

Road[a]	Road segment	Road segment length in miles (km)	1995 average daily traffic	1997 average daily traffic[b]	2
Skull Valley Road	Junction SR 199 at Dugway Proving Grounds to Iosepa	21.3 (34.3)	325	NA	3 4
	Iosepa to Interstate 80 at Timpie Waterfowl Area	15.3 (24.8)	565	NA	5
Interstate 80	Lakeside interchange to Delle interchange [11.2 km (7 miles) west of Skull Valley Road]	6.9 (11.1)	7,790	NA	6
	Delle interchange to Rowley interchange (at Skull Valley Road)	7.0 (11.3)	8,600	8,000	7
	Rowley interchange to Stansbury interchange [11.2 km (7 miles) east of Skull Valley Road]	5.1 (8.1)	8,760	8,495	8
	Stansbury interchange to Burmester interchange	10.3 (17.1)	8,900	9,014	9
	Burmester interchange to Tooele interchange	2.6 (4.2)	25,335	NA	10
SR 36	North incorporated limits of Vernon to junction SR 199	3.7 (6.3)	1,655	1,715	11
	Junction SR 199 to junction SR 73	4.9 (7.9)	3,315	NA	12
	Junction SR 73 to north incorporated limits of Stockton	4.0 (6.4)	4,080	NA	13
	North incorporated limits of Stockton to junction local road to Tooele Army Depot	1.1 (1.8)	9,160	NA	14
	Junction local road to Tooele Army Depot to south incorporated limits and south urban boundary of Tooele	1.3 (2.1)	8,745	NA	15
	South incorporated limits and south urban boundary of Tooele to 300 South in Tooele	0.5 (0.8)	15,885	NA	16
	300 South in Tooele to Vine Street in Tooele	0.3 (0.5)	23,335	NA	17
	Vine Street in Tooele to 100 North SR 112	0.3 (0.5)	21,725	NA	18

Table 3.15. Continued

Road[a]	Road segment	Road segment length in miles (km)	1995 average daily traffic	1997 average daily traffic[b]
	100 North SR 112 to north incorporated limits of Tooele	2.3 (3.7)	11,295	NA
	North incorporated limits of Tooele to north urban boundary of Tooele	5.8 (9.3)	10,155	NA
	North urban boundary of Tooele to junction SR 138 Mills Junction	2.7 (4.3)	10,950	NA
	Junction SR 138 Mills Junction to truck stop service center Interstate 80	0.6 (1.0)	12,300	NA
SR 138	Interstate 80 to east incorporated limits of Grantsville	6.8 (10.9)	5,805	1,260
	East incorporated limits of Grantsville to west incorporated limits of Tooele and junction with SR 36	1.7 (2.7)	6,810	6,245
SR 199	Dugway Proving Grounds East Gate to junction with Skull Valley Road	8.1 (13.0)	675	725
	Junction with Skull Valley Road to Terra	9.3 (15.0)	850	915
	Terra to local road	4.1 (6.6)	890	NA
	Local road to junction SR 36	0.7 (1.1)	1,355	NA

[a]SR = State road
[b]NA = Not available

Source: Utah Department of Transportation, *1995 Traffic on Utah Highways* (traffic.pdf) (obtained from: http://www.sr.ex.state.ut.us/html/site_documents.htm), and PFS/RAI1 1999.

Table 3.16. Monthly and daily traffic on I-80, east of Delle Interchange[a]

Month	Average per day Sunday through Saturday	Average per day Monday through Friday	Month daily average as percent of the year daily average
	I-80, east of Delle Interchange		
January	5,880	5,186	75.5
February	6,566	5,658	84.3
March	7,035	6,307	90.3
April	7,513	6,573	96.5
May	7,996	7,345	102.7
June	9,012	8,430	115.7
July	9,823	9,139	126.1
August	9,686	9,043	124.4
September	8,447	7,746	108.4
October	8,502	7,761	109.2
November	6,654	6,398	85.4
December	6,250	6,106	80.2
Daily average for year	7,789	7,156	NA

[a]NA = not available.

Source: Utah Department of Transportation, *1995 Traffic on Utah Highways* (traffic.pdf).

3.6.2 Archaeological, Native American, and Historic Properties

3.6.2.1 Archaeological Properties

A number of previous archaeological field surveys have been completed in the Skull Valley area. All of these efforts have been completed in response to Federal agency projects requiring cultural resource clearances, such as BLM land exchange parcels (e.g., Christensen 1989; Melton 1998a), fire rehabilitation projects (Melton 1998b), or private projects that require the use of Federal or State lands. Examples of the latter projects that have occurred in Skull Valley include proposed utility corridors, including power line (Nielson 1992; Nielson and Southworth 1992), fiber optic (Billat et al. 1986), road (Talbot 1989), and pipeline (Senulis 1987) rights-of-way and seismic exploration lines (Newsome 1993). In addition to the recording of archaeological properties, several of these projects also recorded historic period properties. Historic sites are discussed in Section 3.6.2.3.

Although few of these inventories encroach on the proposed PFSF project area, the potential does exist for prehistoric sites to occur in Skull Valley, since several sites have been previously identified. Because of the location of many of these past cultural resources projects in the eastern side of the valley, either all or sections of the Skull Valley Road have been inspected on three different

Table 3.17. Generalized cultural sequence for the region including Skull Valley 1

Cultural period	General timeframe	General characteristics	
Paleoindian	10,000–7,000 B.C.	Marked by the presence of large, fluted projectile points, often associated with late Pleistocene/early Holocene beaches. Economic reliance on larger game animals, with exploitation of other resources including marshes and lacustrine areas.	3
Archaic	7,000 B.C.–A.D. 400	Shift in economic focus toward a greater dependence on seeds and plant foods. Settlement and subsistence patterns characterized by exploitation and movement over several ecological zones.	4
Late Prehistoric/ Fremont	A.D. 400–1300	Marked by a change in subsistence to horticulture, with increased reliance on smaller game animals, semisedentary or sedentary villages, and changes in material culture, including basketry, pottery, and milling implements. Five regional Fremont variants are recognized in the eastern Great Basin; Skull Valley is near the boundary of two: the Great Salt Lake Fremont to the north and the Sevier Fremont to the south.	5
Protohistoric/Numic	A.D. 1300–contact with European people	The expansion of the Numic-speaking peoples into the region and the disappearance of the Fremont groups characterize this period. Economic and settlement patterns based on seasonal exploitation of plant and animal resources over a culturally defined territory.	6
Euro-American	About 1820–present	Initial contact by explorers and surveyors in the early 1800s, followed by emigrants using several trails through Utah, and eventually Mormon colonization and settlement of the region. Euro-American presence in Skull Valley marked by transportation routes and sparsely populated ranching activities.	7
Historic Native American	Contact with European people–present	In historic times, the general area was homeland to several Western Shoshone Gosiute[a] groups who occupied Tooele, Rush, Skull, and Deep Creek Valleys. 1863 Treaty between Gosiutes and U.S. eventually led to establishment of Reservations at Deep Creek and Skull Valley.	8

[a]"Gosiute" is a historical spelling of the modern-day "Goshute." 9

10

Contact—when the Native Americans were contacted by the European Advance (traders, advancing homestead). 11

12

occasions. Most of these occur co-located with the springs along the eastern boundary of the distinctive mud flats, in the center of the northern portion of the valley (e.g., Burnt, Muskrat, Horseshoe and Kanaka; see Figure 3.8), or in the vicinity of the higher, more sheltered locations, such as around Delle, Lone Rock and Round Knoll. Most of these archaeological properties are comprised of former campsites with associated artifact scatters.

The major archaeological survey work on the floor of Skull Valley was conducted by the BLM as part of the Dan Freed land exchange that totaled nearly 8,400 acres and is situated north of the Reservation. Cultural resource surveys located 37 prehistoric archaeological sites in these parcels (Christensen 1989), most of which are classified as small scatters of lithic artifacts. Some larger campsites were located, along with three rockshelters and a cave that had been occupied in prehistoric times. While none of these archaeological properties is located in the proposed PFSF project area, the results are indicative of the potential for archaeological resources in the valley. One of the BLM sites, 42TO504, an extensive campsite locality with a surface scatter of stone and ceramic artifacts, was excavated (Smith 1994). This archaeological site lies about 7 miles due north of the preferred site for the proposed PFSF (Site A, see Figures 1.3 and 2.1) on a long low ridge (a linear bar) adjacent to an old playa. Analyses of the materials revealed that the site was probably associated with marsh resources, available at a time when the playa held water. Radiocarbon dates, the ceramics, and some corn remains combine to indicate that occupation of the site dated to the early-mid Fremont time period.

Cultural resources literature searches and field inventories have been completed for the Skull Valley alternative project features. Bright and Schroedl (1998) conducted a Class I (literature and site file coverage) inventory for the proposed ITF just west of Timpie, and the railroad corridor that runs from Skunk Ridge south along the western perimeter of the valley to the Reservation. Along the proposed rail line, the study area included a one-half mile-wide corridor, centered on the proposed alignment. No known prehistoric archaeological properties were identified at either of these project areas, although only a small fraction of the areas under review had received intensive field survey.

In 1999, cultural resource Class III (intensive field survey) studies were conducted at four project areas: (1) the ITF location, comprising about 40 acres about 1.8 miles west of Timpie Junction; (2) the Skunk Ridge transportation corridor from Interstate 80 southward to the Reservation (approximately 1,593 acres); (3) the proposed PFSF area (Sites A and B) and the site access road (about 1,000 acres) on the Reservation; and (4) an exploratory trench (about 6 acres), located along the northern base of Hickman Knolls on the Reservation (Newsome 1999). The results of this survey included confirmation of the crossing of the proposed rail corridor by the historic Hastings Cutoff Trail (see Section 3.6.2.3 and Figure 1.3), and the discovery of one additional cultural site (a rock alignment and associated cairn), and eight isolated artifact occurrences. Because of its current physical integrity, the Hastings Cutoff segment in the project area was evaluated as being potentially eligible for listing on the NRHP; the rock alignment and cairn was not evaluated for Register eligibility, and the isolated finds were judged as not being potentially eligible.

Only one other archaeological survey has been completed on the Reservation itself. In 1995, Talbot (1995) surveyed a 40-acre parcel located about 1 mile northeast of the Tribal village for a proposed reservoir. In addition to the ground coverage, archaeological monitoring was completed during digging of several geological drill and backhoe test trenches. No cultural resources were observed during this project. Just outside the Reservation boundary, about one-half mile west of Sites A and B, BLM archaeologists have completed cultural resources survey of over 2500 acres in a rehabilitation project following the 1998 Tekoi Fire (Melton 1998). No archaeological properties were encountered during this fieldwork.

3.6.2.2 Native American Properties

The Skull Valley and adjacent areas have historically been the homelands of the Gosiute (note "Gosiute" is a historical spelling of the modern-day "Goshute") People, a regional variant of the Great Basin Shoshone culture area (Malouf 1974; Steward 1938; Thomas, Pendleton and Cappannari 1986). Although the Gosiute peoples today occupy two Reservations—the one in Skull Valley and another to the west in Deep Creek—the entire Skull Valley falls within the original exclusively used and occupied Gosiute territory, as determined through litigation before the Indian Claims Commission (Indian Claims Commission, Docket 326, see Horr 1974). For the Reservation, Crum (1987) and Allen and Warner (1971) contain good histories of its historical development.

Early anthropological investigations among the Gosiute reveal the Indians' extensive familiarity with Skull Valley and the resource contained therein. Gathering information from a Skull Valley Gosiute of 76 years of age in the 1930s, who in turn relied on his wife's grandfather for information, Steward (1938, 1943) compiled much data, including listing and mapping of known historic villages in the valley. The former village locations include:

- A cave on the northern end of the Stansbury Mountains, near Timpie
- Haiyacawiyep, a winter village near the town site of Iosepa
- *Iowiba*, a winter village in the mountains, just east of the Reservation
- *Tiava*, another winter village on the present Reservation along Hickman Creek
- *Suhudaosa,* a winter village and dance site, located in the vicinity of the Orr Ranch, just south of the Reservation

Steward also notes that the area just south of Delle was the location of antelope drives, and that communal rabbit drives in Skull Valley were an important source of food.

Ralph Chamberlin, another early 1900s scientist, collected a considerable amount of information from the Gosiute People, including plant names and uses (Chamberlin 1911), place names (Chamberlin 1913), and animal names (Chamberlin 1908). In Skull Valley, Chamberlin provides Gosiute names for many of the springs and creeks, along with other named places. Chamberlin gives Gosiute names and uses for several hundred plants and plant parts that are available throughout the Gosiute territory.

Within the proposed PFSF project area, no traditional cultural properties or usage of culturally important natural resources have been documented. According to Skull Valley Band responses on this topic, the same is generally true for Skull Valley as a whole (PFS/RAI1 1999). Traditional plants of value to the Skull Valley Band, such as sage and cedar, are sparse in the project area due to a lack of surface water, and are considered inferior to the same plants growing in the Stansbury Mountains east of the Reservation, and in the adjacent Tooele Valley. There are no known uses of traditional plants by other Federally Recognized Indian Tribes within Skull Valley.

3.6.2.3 Historic Properties

As a result of Euro-American encroachment into Skull Valley over the past 150 years, there are a number of historic properties throughout the valley, many of which have been formally recorded as cultural resources. The historic properties can be discussed in four broad categories: (1) transportation (trails, roads, and railroad related) sites; (2) communication (telegraph and telephone): (3) settlements; and (4) ranches and other sites.

Transportation. Several mid-19th century historic trails either traversed Skull Valley, or intersected the northern part of the valley as travelers skirted the southern boundary of the Great Salt Lake, all funneled through the Timpie area (DeLafosse 1994; 1998; Kelly 1996; Miller 1958). These are listed as follows:

- Jedediah S. Smith (1826–27)—crossed north to south through the western part of Skull Valley on his way to California
- John W. Gunnison and E. G. Beckwith (1853–54)—crossed from north to south along the western edge of the valley, crossing the Cedar Mountains at Beckwith Pass
- John C. Fremont (1845) and Howard Stansbury (1849–50)—both passed along the south part of the Great Salt Lake, through the northern part of Skull Valley
- Hastings Cutoff (1846–50)—opened by Lansford Hastings following the Fremont survey, this was Utah's first significant emigrant trail and was used for a five-year period, including the well-documented and ill-fated Donner-Reed Party in 1846. Leaving the Timpie vicinity, this trail passed southward along the east part of Skull Valley, paralleling the Skull Valley Road of today and passing Burnt, Muskrat, and Horseshoe Springs, to the location of the future town site of Iosepa and later the Deseret Ranch. A little to the south of this location the trail turned northwest across the valley and skirted the worst of the mudflats extending southward from the Great Salt Lake (This stretch is known today as Hastings Road). Reaching the west side of Skull Valley at Redlum Spring, the trail went through Hastings Pass across the Cedar Mountains.

In 1851, the Overland Mail route was established through the southern part of Skull Valley, diverting transcontinental traffic away from the project area (Fike and Headley 1979). A network of secondary roads serving local ranch traffic and possibly some long distance travel was established across northern Skull Valley by 1871 (GLO Map 1915).

In the early 1900s, the advent of automobile traffic created another travel opportunity through Skull Valley. In 1913, the Lincoln Highway Association established a highway from New York City to San Francisco (Hokanson 1988). West of Salt Lake City, the original route of this highway passed through Grantsville, turned south at Timpie and passed through Skull Valley along the current Skull Valley Road alignment (Knowlton n.d.; Lincoln Highway Association-Utah Chapter n.d). However, in 1919 a road was cut through the Stansbury Mountains, and the route was changed to go through Tooele, over the pass, and across the southern part of Skull Valley. Several past cultural resources inventories have occurred along much or part of the Skull Valley Road. These inventories have recorded some prehistoric archaeological sites along the corridor, particularly in the section between Timpie and Iosepa. The Lincoln Highway itself has received little attention as a historic property. BLM archaeologists recorded a one-mile section of the road lying south of the Reservation as 42TO1077 (Melton 1998a). In 1927, the route was changed again to cross the northern end of Skull

Valley, following the route of the Western Pacific Railroad. This alignment is also known as the Victory Highway (Petersen 1999).

The Lincoln-Victory Highway era came to an end with the construction of U.S. Highway 40, also following the railroad across northern Skull Valley. U.S. 40 brought in the era of hard surfaced crowned highway transportation. The highway was slightly realigned at least once before being replaced by the modern Interstate 80. U.S. 40 has never been recorded as a historic property nor evaluated for National Register eligibility.

The Western Pacific Railway Company initially completed the present Union Pacific rail line that crosses the northern part of Skull Valley in 1906-07. Recent cultural resources inventories of utility corridors that parallel the railroad have recorded several historic sites (Billat et al. 1986; Nielson 1992). These sites, along with their NRHP evaluations, include:

- Timpie Railroad Siding (42TO453)—evaluated as being potentially eligible for the NRHP
- Historic buildings just north of Delle (42TO733)—not eligible
- Low Railroad Siding (42TO4550)— potentially eligible

The railroad itself has never been recorded as a historic property nor evaluated for National Register eligibility.

Communication. The southern end of Skull Valley, along the Overland Stage Road, was the route of early communication endeavors including the Pony Express from 1860–1861 and the transcontinental telegraph from 1861–1869 (Fike and Headley 1979). Later, Western Union telegraph lines were established along both sides of the Western Pacific across northern Skull Valley (GLO Map 1915). Early telephone lines followed the same corridor. None of these lines have ever been recorded as historic properties or evaluated for National Register eligibility.

Settlements. Aside from the village on the Reservation, the only permanent settlement to have located in Skull Valley is the town of Iosepa (1889–1917), a settlement of Hawaiian immigrants who had come to the Salt Lake City area following their conversion to the Mormon Church (Atkin 1958; Gregory 1948). In 1917, nearly all of the inhabitants returned to their native land and the town site became the headquarters of ranching operations, first known as the Deseret Livestock Company and today as the Skull Valley Ranch Company. Skull Valley Road passes through the current ranch, and along the west boundary of the former town site.

The town site was formally recorded as an historic property in 1989 (Talbot 1989) under the site number 42TO540 and evaluated as being eligible for listing in the NRHP. Three to five structures exist at the site which may date to the original town (two may have been constructed on earlier foundations in the 1930s). Each of these structures has been recorded separately in the Utah SHPO file system. The Iosepa Cemetery (Poulsea n.d.) was nominated and listed on the NRHP in 1970. In 1987, the BLM completed an Environmental Assessment to allow the Iosepa Historical Association a Recreation and Public Purposes Act lease that would allow public access and maintenance activities on the part of the cemetery that lies on public lands (BLM 1987).

Ranches and other sites. A number of historic ranches, active and abandoned, lie along Skull Valley Road. To date, none of these has been recorded as historic properties nor evaluated for

NRHP eligibility. One historic smelter site (42TO236) has been recorded in the northern part of Skull Valley.

3.7 Background Radiological Characteristics

This section presents the background radiological characteristics of the proposed site. Background radiation is created by sources such as cosmic rays; radioactivity naturally present in soil, rocks, and the human body; and airborne radionuclides of natural origin (e.g., radon). Radioactivity still remaining in the environment as a result of the atmospheric testing of nuclear weapons also contributes to the background radiation level, although in very small amounts. Table 3.18 lists the average radiation dose to a member of the U.S. population from naturally occurring and artificial radiation sources. A discussion of radiation dose assessment terminology is presented in the sidebar box below.

A portion of the background radiological characteristics of the proposed PFSF site were determined from a survey of area gamma radiation levels (i.e., cosmic plus terrestrial components of Table 3.18) and samples of the surface soils (PFS/ER 2000). The area gamma measurements were obtained from thermoluminescent dosimeters (TLDs). Two of these dosimeters are located on the proposed PFSF meteorological tower and one is on the exterior of the Pony Express convenience store. The tower and the store are both located on Skull Valley Road, about 5 km (3 miles) southeast of the proposed PFSF site. During the period from December 1996, through January 2000, the average exposure rate measured by the dosimeters (cosmic and terrestrial components) was equivalent to 0.84 mSv/yr (84 mrem/yr) which is approximately 1.5 times the national average.

PFS collected five soil samples from the surface of the proposed site in November 1996. The approximate locations of the samples were at the center and at each of the four corners of the site. The radiological analysis consisted of gross alpha/beta spectrometry for radionuclide concentrations. Detectable alpha radiation ranged from 8.6 to 11 pCi/g, and the beta from 22 to 37 pCi/g. A gamma spectrometry analysis was also conducted on the soil samples. The range of results, above detectable limits, included the radionuclides shown in Table 3.19. With the exception of cesium-137 (which originates from atmospheric nuclear tests), the radionuclides in Table 3.19 are all parts of the decay chain of naturally occurring uranium. These concentrations are in general agreement with similar surveys performed for the nearby Envirocare of Utah site at Clive, Utah, about 40 km (24 miles) northwest of the proposed PFSF site (NRC 1993) (see Figure 1.1).

There are no perennial surface waters within 8 km (5 miles) of the proposed PFSF site, and, consequently, no water samples were taken for radiological analysis. Although no radiological samples of the vegetation were obtained, an indication of the radiation levels in area vegetation and in the flesh of mammals (i.e., rabbits) was reviewed as part of the environmental study for the Envirocare facility (NRC 1993) and is summarized in Table 3.20.

Although PFS considers the background radioactivity levels in vegetation and mammal flesh in the vicinity of the Envirocare facility to be representative of the background radioactivity levels near the proposed PFSF site and along the proposed Skunk Ridge rail corridor, PFS has stated that it will establish a preoperational radiological environmental baseline. The baseline will include sampling for radioactivity in soil, groundwater, vegetation, and the flesh of non-migratory mammals near the proposed PFSF site.

Table 3.18. Average annual effective dose equivalent of ionizing radiations to a member of the U.S. population

Source of radiation	Effective dose equivalent mSv (mrem)	Effective dose equivalent Percent
Natural		
Radon[a]	2 (200)	55
Cosmic	0.27 (27)	8
Terrestrial	0.28 (28)	8
Internal	0.39 (39)	11
Total natural[b]	***3 (300)***	***82***
Artificial		
Medical		
X-Ray Diagnosis	0.39 (39)	11
Nuclear Medicine	0.14 (14)	4
Consumer Products	0.1 (10)	3
Other		
Occupational	less than 0.01 (less than 1)	less than 0.03
Nuclear Fuel Cycle	less than 0.01 (less than 1)	less than 0.03
Fallout	less than 0.01 (less than 1)	less than 0.03
Miscellaneous[c]	less than 0.01 (less than 1)	less than 0.03
Total artificial[b]	***0.63 (63)***	***18***
Total natural and artificial[b]	***3.6 (360)***	***100***

[a]Dose equivalent to bronchi from radon daughter products.
[b]Totals have been rounded and may not be numerically identical to the sum of the dose values shown.
[c]From Department of Energy facilities, smelters, transportation, etc.

Source: NCRP 1987.

Table 3.19. Radionuclides found in five soil samples from the proposed PFSF site

Radionuclide	Range of activity (in pCi/g)
Potassium-40	10 to 16
Cesium-137	0.07 to 6.1
Lead-210	0.58 to 1.1
Bismuth-212	0.97 to 1.3
Lead-212	0.50 to 0.85
Bismuth-214	0.92 to 1.4
Lead-214	0.76 to 1.1
Radium-223	0.24 to 0.52
Radium-224	3.0 to 9.6
Radium-226	1.3 to 2.3
Actinium-228	0.75 to 1.2
Protactinium-231	2.2 to 3.1
Uranium-235	0.08 to 0.14
Uranium-238	0.57 to 1.4

Source: PFS/ER 2000.

Note: Only radionuclides with activities above detectable limits have been included.

Table 3.20. Radionuclides found in vegetation and rabbit flesh as part of the Envirocare environmental study

Radionuclide	Activity in vegetation (average, pCi/kg)	Activity in rabbit flesh (average, pCi/kg)
Lead	198.0	4.0
Polonium-210	48.0	8.0
Radium-226	3.1	0.6
Thorium-230	6.0	0.5
Uranium	5.4	0.5

Note: Activities are shown on a "wet weight" basis.

Source: U.S. Nuclear Regulatory Commission, 1993, *Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 11e.(2) Byproduct Material Near Clive, Utah*. Docket No. 40-8989, NUREG-1476. Washington, D.C.

RADIATION DOSE ASSESSMENT TERMINOLOGY

Ionizing radiation: Electromagnetic waves or particles that are energetic enough to cause the production of ions upon interacting with matter.

Gamma radiation: High-energy, short wavelength electromagnetic radiation (packet of energy) emitted from the nucleus of an atom. Gamma rays are similar to X-rays but have a higher energy.

Maximally exposed individual (MEI): A hypothetical person who is assumed to be continuously present near (typically within 30 m) a transportation corridor for all spent nuclear fuel shipments or at the closest publicly accessible locations for a fixed site (such as the proposed PFSF storage area).

Curie (Ci): The basic unit used to describe the intensity of radioactivity in a sample of material. A curie is a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second.

Picocurie per gram (pCi/g): One trillionth part of a curie of a radioactive substance in a gram of matter. This unit is often used to express the quantity of radioactivity in water, soil, vegetation and animal tissue samples.

Rad: The rad is a unit of absorbed radiation dose in terms of energy. One rad is equal to an absorbed dose of 100 ergs/gram.

Rem: The unit of equivalent dose in humans. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor. The quality factor is the modifying factor used to derive dose equivalent from absorbed dose. This factor is necessary because differing radiation types can produce different biological effects even if they deposit the same amount of energy in a given tissue.

Person-rem: The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

Person-sievert (person-Sv): A unit of collective dose equivalent to 100 person-rem.

Sievert (Sv): A unit dose equivalent to 100 rem.

Latent cancer fatality (LCF): A latent cancer fatality is a death from cancer resulting from, and occurring an appreciable time after, exposure to ionizing radiation. The probability of developing a fatal cancer from exposure to 1 rem of ionizing radiation is estimated to be 0.0005 (5 chances in 10,000). The coefficients or factors used for health effects in this DEIS for the public and occupational radiation risk are 5×10^{-4} and 4×10^{-4} health effects/rem, respectively. These coefficients are based on data obtained at much higher doses and dose rates than those encountered by the general public or workers. A linear extrapolation from the lowest doses at which effects are observable down to the occupational range was used to generate these coefficients. The assumption of a linear extrapolation has considerable uncertainty, but is believed to present a conservative estimate of the risk.

In a population of 10,000 people, national statistics indicate that about 2,224 people would die from cancer of one form or another. Using information developed by the International Commission on Radiological Protection, if all 10,000 people received a dose of 200 millirem (in addition to the normal background radiation dose), 1 additional cancer fatality would be estimated to occur in that population. However, we would not be able to tell which of the 2,225 fatal cancers was caused by radiation, and the additional radiation would possibly cause no fatal cancers.

Sometimes, calculations of the number of latent cancer fatalities associated with radiation exposure do not yield whole numbers, and may in fact yield numbers less than 1.0. For example, if each individual in a population of 100,000 received a total dose of 0.001 rem, the collective dose would be 100 person-rem and the corresponding estimated number of latent cancer fatalities would be 0.05 (that is 100,000 persons × 0.001 rem × 0.0005 latent cancer fatality per person-rem). Because this numerical result is less than 1 fatality, further interpretation (as discussed below) is required. The result must be interpreted as a statistical estimate. That is, 0.05 is the *average* number of death that would result if the same exposure situation were applied to many different groups of 100,000 people. For most groups, no single individual would incur a latent cancer fatality from the 0.001 rem dose each person would have received. In a small fraction of the groups, 1 latent fatal cancer would result; in exceptionally few groups, 2 or more latent fatal cancers would occur. The *average* number of deaths over all of the groups would be 0.05 latent fatal cancer (just as the average of 0, 0, 0, and 1 is 1/4 or 0.25). For the scenario under discussion, the most likely outcome for any single group of exposed persons is 0 latent cancer fatalities.

3.8 Other Environmental Features

3.8.1 Ambient Noise Levels

Background noise levels in Skull Valley are low. Where natural sounds, such as those from flying insects and wind become dominant, daytime sound levels can drop to 30 dB(A) and lower. This is quieter than many locations that are considered "remote." However, the relative quiet of Skull Valley is interrupted by routine military flight operations. Existing vehicle traffic increases noise levels near Skull Valley Road, especially in areas where people congregate. Daytime background levels of 48 to 50 dB(A) have been measured about 18 m (60 ft) from Skull Valley road near the Pony Express Convenience Store. For comparison, EPA (1974) has provided guideline sound levels below which the general public would be protected from activity interference and annoyance; 55 dB(A) applies to outdoor locations "in which quiet is a basis for use" and 45 dB(A) applies to indoor residential areas.

3.8.2 Scenic Qualities

The proposed PFSF would be located approximately in the center of the southern third of Skull Valley. This portion of the valley is largely undeveloped and features numerous scenic qualities, including clear views of the Stansbury Mountains to the east (see Figure 3.10) and distant views of the Cedar Mountains to the west (see Figure 3.11). The Stansbury Mountains rise to heights of over 2,743 m (9,000 ft) in several places, with Desert Peak being over 3,352 m (11,000 ft). Some ridges in the Cedar Mountains are at elevations of over 2,134 m (7,000 ft). These two mountain ranges define Skull Valley and provide its most important scenic qualities.

The proposed site also offers expansive views across the floor of Skull Valley between the mountain ranges. The landscape in the vicinity of the proposed site is dry rangeland interspersed with some irrigated fields. Several ranch residences and ranch-related buildings with small numbers of cattle are scattered throughout the valley, but the predominant landscape characteristic is the vast expanse of undeveloped and uncultivated land.

The most noticeable manmade feature in the valley is Skull Valley Road, which is located just west of the Stansbury Mountains and about 20 km (12 miles) east of the Cedar Mountains. A single overhead power distribution line on wooden poles parallels Skull Valley Road from Interstate 80 south to Dugway.

Skull Valley is most often viewed by local residents and motorists on Skull Valley Road. There are approximately 150 residents of the valley, and Average Daily Traffic (ADT) on Skull Valley Road in 1997 was 325 vehicles south of the town of Iosepa (PFS/ER 2000) (see Table 3.15). In terms of visual exposures to the proposed site, this ADT represents almost 120,000 annual vehicle trips multiplied by the average number of passengers per vehicle. Most of the ADT on the road is comprised of trips made by the relatively few individuals who reside or work in Skull Valley or Dugway.

Skull Valley is also viewed by hikers, hunters, campers, and other visitors in the Wasatch-Cache National Forest and the Deseret Peak Wilderness area to the east, and in the Cedar Mountains Wilderness Study area to the west. In 1997, for example, there were 9,600 visitor days classified as hiking, hunting, and camping in the Deseret Peak Wilderness (J. Van Dyke, Oak Ridge National

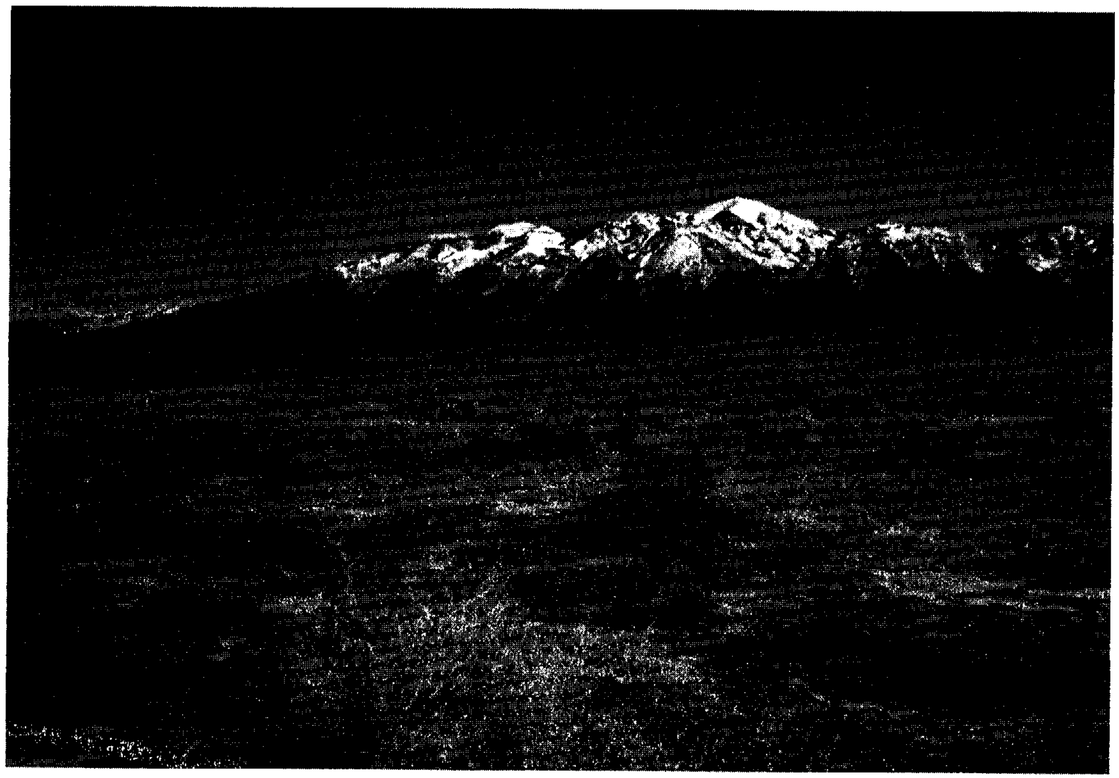


Figure 3.10. View from the proposed PFSF site looking east toward the Stansbury Mountains.

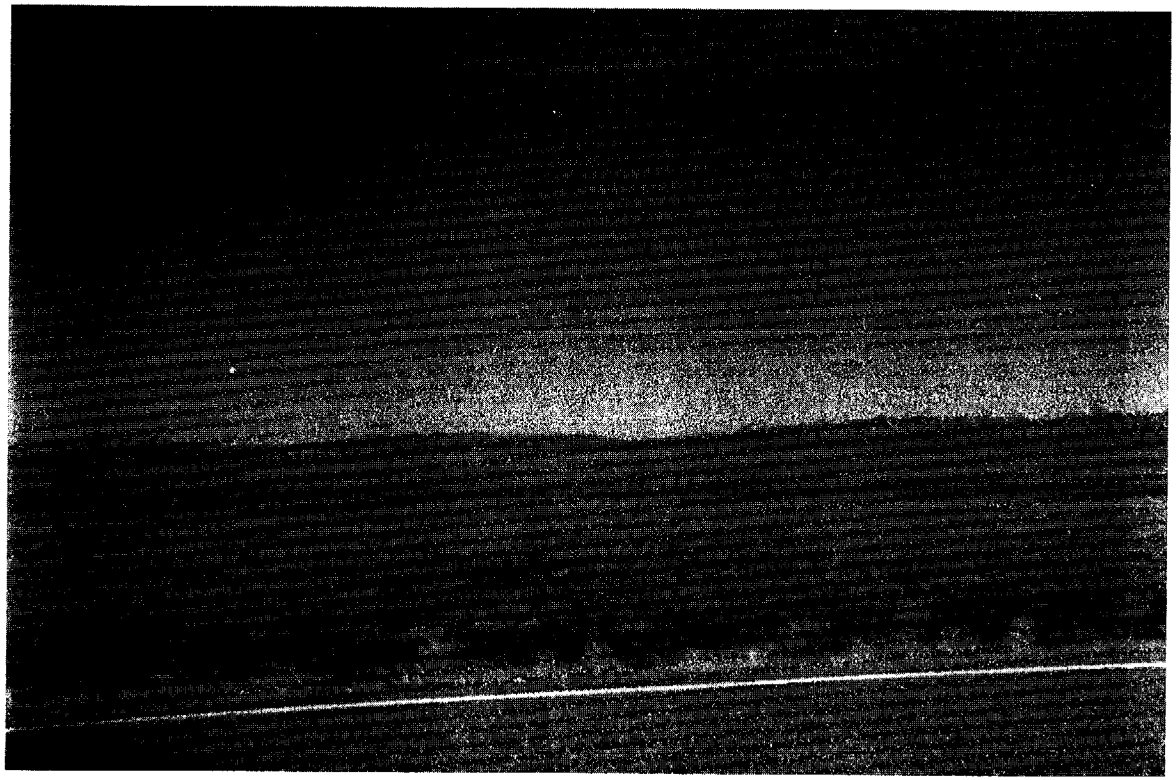


Figure 3.11. View from Skull Valley Road looking west toward the Cedar Mountains.

Laboratory, Oak Ridge, Tenn., personal communication with Jack Vanderberg, Acting Recreation Manager, Salt Lake Ranger District, Wasatch-Cache National Forest, January 27, 1999). Although data on the exact locations of recreational visits are not available, at least some visitors view Skull Valley from the Wasatch-Cache National Forest, the Deseret Peak Wilderness area, and the Cedar Mountains Wilderness Study area (see Section 3.8.3).

3.8.3 Recreation

BLM land in Skull Valley provides opportunities for recreation, including off-highway vehicle (OHV) use, dispersed camping, and hunting. Under its OHV designation, the BLM land near the proposed PFSF is open to all types of motor vehicle use (BLM 1992b). However, there are no designated camping areas or OHV trails or roads within a 8 km (5 mile) radius of the proposed PFSF (PFS/ER 2000). Horseshoe Springs, 24 km (15 miles) north on Skull Valley Road, is the closest developed recreation facility on BLM land (see Figure 1.2). BLM reports visitor use of this area at 500 to 1,000 visits per year (PFS/ER 2000), although there is a considerably greater recreational use of BLM land in areas just outside Skull Valley.

In addition to BLM land, recreational visitors use other resources in the vicinity of the proposed project, including Mount Deseret [approximately 15 km (9 miles) northeast of the proposed PFSF] in the 10,120 ha (25,000 acre) Deseret Peak Wilderness located within the Stansbury Mountain unit of the Wasatch-Cache National Forest. The U.S. Forest Service manages the area for primitive recreational use at dispersed locations; developed recreational facilities and motorized vehicles are prohibited in wilderness areas. Recreational activity includes hiking, hunting, and horseback riding. The number of annual recreational visits to the Deseret Peak Wilderness is estimated at 18,000 (PFS/RAI1 1999). In addition to the Deseret Peak Wilderness, the Forest Service provides recreational opportunities in the Wasatch-Cache National Forest, including camping and hiking. The Forest Service estimates 17,000 visits annually within the six campgrounds maintained by the Forest Service in the Wasatch-Cache National Forest and 9,500 visits per year to two trail heads maintained within the Wasatch-Cache National Forest. Besides the view of the landscape, the Skull Valley Road provides significant opportunities to view raptors.

Wilderness. The BLM also administers the 20,445 ha (50,500 acres) Cedar Mountains Wilderness Study Area (WSA), which provides opportunities for solitude, primitive and unconfined recreation, including the opportunity to view wild horses, deer and upland game hunting, hiking, backpacking, and horseback riding and packing (BLM, Utah Wilderness Inventory 1999, accessed from the internet at http://www.ut.blm.gov/wilderness/wrpt/wrptcontents.html).

In addition, the BLM has recently re-inventoried some lands within Utah, including areas near the Cedar Mountains WSA for their wilderness characteristics. This re-inventory identified six units (i.e., parcels of land or sections) adjacent to the Cedar Mountains WSA, with a total of 6,290 ha (15,540 acres), having wilderness characteristics (BLM, Utah Wilderness Inventory 1999, accessed from the internet at http://www.ut.blm.gov/wilderness/wrpt/wrptcontents.html). Of these six units, Units 1, 2, and 3 are on the northern, northeastern, and eastern portions of the Cedar Mountains WSA, respectively, and are closest to the route of the proposed rail line from Skunk Ridge to the proposed plant site (see Figure 3.12).

The six units enhance the opportunities for solitude and primitive recreation found within the adjacent Cedar Mountains WSA. In addition, Unit 1 has supplemental values related to a historic

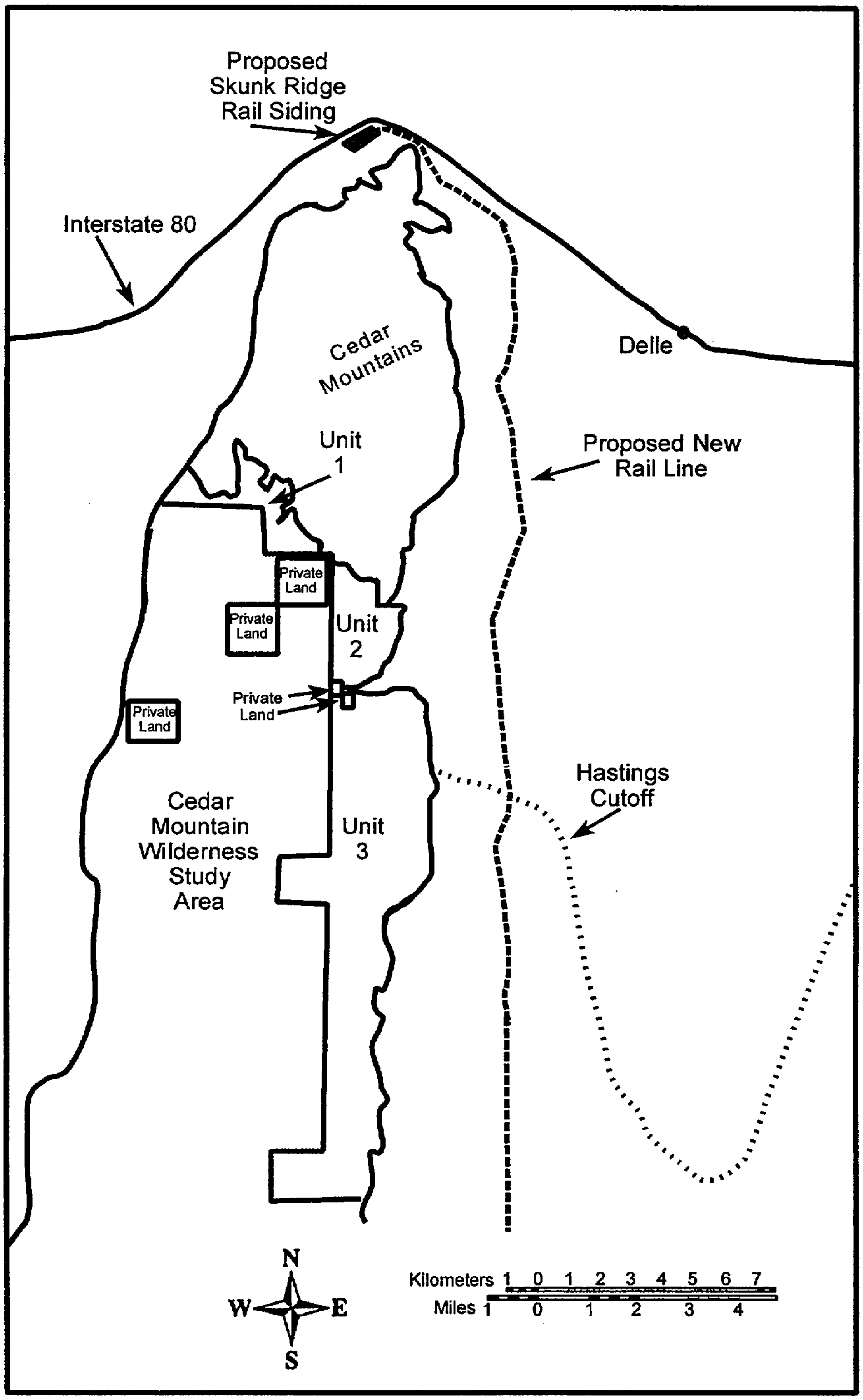


Figure 3.12. Wilderness study areas and unit areas recently inventoried for their wilderness characteristics.

trail. Hastings Cutoff through Hastings Pass at the northern end of Unit 1 was once the path taken by travelers using the historic California Trail. The Hastings Cutoff segment of the California Trail was the route taken by the Donner Party on their fateful journey to California. The California Trail is a designated National Historic Trail (BLM, Utah Wilderness Inventory 1999, accessed from the internet at http://www.ut.blm.gov/wilderness/wrpt/wrptcontents.html).

4. ENVIRONMENTAL CONSEQUENCES OF CONSTRUCTING AND OPERATING THE PROPOSED PFSF

This chapter describes how the natural and human environment could be affected by the construction, operation, and decommissioning of the proposed facility in Skull Valley, Utah. This chapter presents or references relevant data, describes the approach and methods used to predict future environmental effects, and presents an assessment of the potential environmental impacts.

Each subsection describes, as appropriate, any potential impacts to specific categories of environmental resources. Each subsection also contains a concluding statement as to whether the potential impacts are judged to be small, moderate, or large. The standards used for these concluding statements are presented in the dialogue box below. In addition to a discussion of the potential impacts, the possible mitigation measures that could be employed to eliminate or reduce the magnitude of any impacts are also presented and discussed within each subsection. Each subsection identifies certain of the possible mitigation measures that the cooperating agencies recommend be required. See Section 9.4.2 for a complete list of the mitigation measures that the cooperating agencies recommend be required.

The proposed action under consideration in this DEIS involves the construction and operation of the proposed PFSF in Skull Valley, Utah, and the construction and operation of new transportation facilities in Skull Valley for moving SNF to the proposed PFSF. This chapter does not address the impacts of constructing and operating either a new rail line or an ITF. The environmental impacts of the new transportation facilities are discussed in Chapter 5 of this DEIS. This chapter focuses only on the construction and operation of the proposed PFSF on the Reservation.

Section 4.9 also discusses decommissioning of the proposed PFSF. This discussion is based on currently available information. Because decommissioning would take place well into the future, all technological changes that could improve the decommissioning process cannot be predicted. As a result, the NRC requires that an applicant for decommissioning of an ISFSI submit, at least five years prior to the expiration of the NRC license, a Decommissioning Plan. The requirements for the Final Decommissioning Plan are delineated in 10 CFR 72.54(g)(1)–(6), 72.54(d), and 72.54(i). This plan will be the subject of further NEPA review that would result in the NRC staff's preparing an environmental assessment or environmental impact statement, as appropriate, at the time the Decommissioning Plan is submitted to the NRC.

As shown in Figures 2.1 and 2.11, there are two potential sites for the proposed PFSF in Skull Valley. Both sites are located on the Reservation. The proposed action being evaluated in this DEIS involves a location for the proposed PFSF in the northwest corner of the Reservation, which is designated as "Site A" (see Figure 2.1). An alternative site, also being evaluated in this DEIS, lies to the south of Site A on the Reservation and is designated as "Site B" (see Figure 2.11). The assessments described in this chapter distinguish the impacts associated with Site A from those at Site B wherever possible.

DETERMINATION OF THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS
A standard of significance has been established by NRC (see NUREG-1437) for assessing environmental impacts. With the standards of the Council on Environmental Quality's regulations as a basis, each impact is to be assigned one of the following three significance levels: • ***Small:*** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. • ***Moderate:*** The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource. • ***Large:*** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

4.1 Geology and Soils

This section discusses the assessment of potential environmental impacts to geologic resources (such as minerals) and soils during site preparation, construction, and operation of the proposed facility. Impacts could result from planned excavation activities for the proposed PFSF and the consumption of mineral resources for use in roadbeds and as materials of construction. The adequacy of the proposed PFSF design to withstand earthquakes will be addressed in the NRC's final SER and is not addressed in this DEIS.

4.1.1 Construction Impacts at the Preferred Site (Site A)

Environmental impacts to soils include loss of the soils resource because of physical alterations to the existing soil profile. These alterations lead to a reduction in the soils' ability to support plant and animal life and may possibly lead to changes in windborne erosion patterns, changes in surface water drainage and erosion patterns, and changes in infiltration characteristics. The impacts to land use and the loss of vegetation and habitat are described in Sections 4.4 and 4.5, windborne erosion impacts in Section 4.3, surface water drainage and water erosion impacts in Section 4.2, and infiltration impacts in Section 4.2. Impacts would also occur to economic geologic resources (e.g. aggregate) from their use as construction materials and from possible access restrictions to minerals beneath the site. As discussed below, impacts to the loss of the soils resource and to economic geologic resources would be small.

The assessment for the loss of the soils resource compares the amount of soil to be lost at the proposed PFSF site with the amount of similar soils resources available in Skull Valley. The assessment of impacts to economic geologic resources (e.g. aggregate) compares the estimated amount of materials required for construction with the availability of those resources in the area. It also considers the impacts to mineral resource exploitation in the immediate area of the proposed PFSF.

The uppermost 7.5 to 15 cm (3 to 6 inches) of soil on the 99-acre pad area (roughly 80,000 yd^3) would be stripped and used for construction of the earthen flood protection berms, and for access and perimeter roadway slope dressing. The pad area would then be further excavated to a depth of 1.2 to 2 m (4 to 6 ft) [i.e., 93,000 m^3 (1,000,000 yd^3)], and the spoils would be stockpiled and used to make a soil/cement pad base material (see Section 2.1.1.2). None of this spoil material would leave the site; thus, there would be no impacts to any potential off-site fill areas or disposal sites (see Section 4.9 for decommissioning of the berms). Even if all of this soil is used in the soil/cement mixture, it represents a loss of less than 0.04 percent of the upper 1.2 to 2 m (4 to 6 ft) of soil in Skull Valley. While detailed differences exist in the characteristics of Skull Valley soils, they are generally similar, and those at the proposed PFSF site have no unusual characteristics that make them of greater intrinsic value. The impacts to loss of the soils resource is thus considered to be small.

The cask storage pads would be independent structural units (see Figure 2.3). Each pad is 9 m wide by 19.5 m long by 1 m thick (30 ft wide by 64 ft long by 3 ft thick). Excavation of soils at the preferred site would be required so that the pads would be nearly flush with grade level for direct access by the cask transporter. Foundation preparation for the pads would consist of the necessary soil excavation and placement of a 1.2 to 2 m (4 to 6 ft) thick concrete soil/cement mat on the in-situ soil. The bottom of the mat and the bottom of the storage cask pads would be well below the local frost depth of 75 cm (30 inches) below grade level (PFS/ER 2000). This would prevent upward movement of the pads due to the "heaving" and other ground motions associated with the freeze-thaw cycle.

PFS has performed field and laboratory geotechnical investigations of site soils. The adequacy of those studies to assess site soils and the test results to demonstrate that site soils can accommodate the storage cask pads and canisters is addressed in PFS's SAR (PFS/SAR 2000) and the NRC SER. The estimated settlement of each pad is 8 cm (3.3 inches); hence, the tops of the finished pads would be constructed approximately 9 cm (3.5 inches) above grade to accommodate the anticipated amount of settlement.

Resources such as concrete aggregate, crushed rock, and asphalt would be required during construction of the proposed PFSF. Table 4.1 compares anticipated construction material requirements for all phases of construction of the proposed PFSF with estimated quantities of such materials available from five private, commercial sources in the vicinity of Skull Valley (see Table 3.2). PFS would be able to use any or all of these locations for the source of construction materials (PFS/ER 2000). These five sites are located within 10 to 75 highway km (6 to 48 highway miles) of the proposed PFSF. BLM notes the existence of five additional sand and gravel pits within and immediately outside Skull Valley but provides no material quantity estimates. However, considering only the estimated quantities of material available from the five private, commercial sources in Table 4.1, no more than about one-third of this material would be required for the proposed PFSF construction. Including other sources, such as those on BLM land, would reduce that percentage further. The impacts on aggregate material for site construction are thus considered to be small.

Mineral resources located beneath the site would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region. No mitigation measures are warranted for the loss of the soils resource or the unavailability of minerals during facility construction.

4.1.2 Impacts During Operations at the Preferred Site

Operational impacts include the use of aggregate and materials used for the continued construction of the concrete storage pads and the unavailability of mineral resources. These impacts are included in the discussion above and have been determined to be small. Other than construction of the

Table 4.1. Comparison of PFSF construction material requirements with quantities of materials commercially available in the vicinity of Skull Valley

Material type	Material required	Material available
Concrete aggregate		
Small (sand)	97,500 m^3 (128,000 yd^3)	300,000 m^3 (393,000 yd^3)
Large (crushed rock)	136,000 m^3 (178,500 yd^3)	465,000 m^3 (607,000 yd^3)
Crushed rock for access road base, storage area, and building grading	121,000 m^3 (159,000 yd^3)	600,000 m^3 (786,000 yd^3)
Common fill materials	112,000 m^3 (147,000 yd^3)	300,000 m^3 (393,000 yd^3)

storage casks themselves, materials needed for facility construction would no longer be needed, and no further depletion of those resources would be anticipated. No mitigation measures are warranted for the loss of soils resources or the unavailability of minerals during facility operation.

4.1.3 The Alternative Site (Site B) in Skull Valley

The impacts to soils and economic geologic resources for the alternative site (Site B) are the same as for the preferred site (Site A). The geologic setting for the alternative site (Site B) is not environmentally differentiable or significantly different from the preferred site (Site A). Thus, the environmental impacts to soils and economic geologic resources from the construction and operation of the proposed PFSF at Site B would not be quantifiably different from those at the preferred site (Site A). No mitigation measures are warranted for the loss of the soils resource or the unavailability of minerals during construction or operation of the facility operation at the alternative site (Site B).

4.1.4 Mitigation Measures

Based on the above discussion of the impacts to soils and economic geologic materials (aggregate), no mitigation measures were identified that would appreciably reduce the impact, beyond those described in Sections 4.2, 4.3, 4.4, and 4.5 to address the types of impacts identified in the first paragraph of Section 4.1.

4.2 Water Resources

This section discusses the assessment of potential environmental impacts to surface water and groundwater during construction and operation of the proposed PFSF including the proposed site access road from Skull Valley Road to the site. The discussion includes the potential impacts to surface water flow at the valley-wide scale, as well as impacts to natural drainages on and around the site, and potential degradation of water quality or supply.

4.2.1 Construction Impacts at the Preferred Site (Site A)

4.2.1.1 Surface Water

This section discusses potential impacts to the surface water flow system during and as a result of construction activities. Construction of the facility and the site access road are discussed separately.

Facility construction. As discussed below, impacts to the surface water flow system in Skull Valley would be small as a result of construction of the facility at the preferred site. Small impacts to local ephemeral drainage features would occur during and as a result of the construction and presence of the facility.

Construction of the proposed PFSF would require modification of the existing surface drainage system within the site footprint and small changes in surface water runoff volumes and patterns would result. The principal modification to local surface drainage features would be the construction of the flood diversion berm, an approximately 1,310 m (4,300 ft) earthen berm along the southern and western sides of the facility (see Figure 2.2). This berm would divert normal and flood flows of surface water from upslope and adjacent areas from the west to a discharge location near the northwest corner of the facility. The proposed PFSF is 40-ha (99-acre) facility in which existing surface drainage features would be modified to provide engineered foundations and a contained runoff area for the facilities. The total watershed area of Skull Valley is 181,000 ha (448,000 acres). The footprint of the facility is 0.02 percent of the total watershed area. Alteration of the surface water runoff or infiltration characteristics of this small proportion of the watershed would not have a noticeable effect on surface water flows in the Skull Valley watershed.

After construction of the surface water detention basin, surface runoff from within the facility area would be directed into the basin where infiltration into soils and evaporation would occur. According to PFS's construction sequencing plan (PFS/ER 2000), the first period of activities in Phase 1 construction would include construction of the site access road with its flood protection berm, and initial earthwork in the southeast quadrant of the cask storage area. During the second period of Phase 1 construction activities the storage area would be leveled, the facility's flood protection berm constructed, and the surface water detention basin would be constructed. During a short time (weeks) in Period 1 and an unspecified time in Period 2, there would be a potential for water erosion to transport disturbed site soils into the local drainage features in the event of severe storms. The magnitude of such effects would depend on unpredictable seasonal variables in weather conditions. Assuming that erosion control measures would be implemented and would function as intended, impacts to local surface water drainage channels would be small. Additional discussion of potential impacts from flooding during extreme events is presented below.

Once constructed, the site surface water runoff collection system would be sized to contain all site runoff up to and including the precipitation associated with a 100 year flood event (i.e., 100 year flood). This would prevent the site from having any adverse effect on area flooding under conditions equal to or less than a 100-year flood. The construction BMPs (see Section 2.1.4) include measures to protect the local drainage features outside the immediate construction footprint from siltation. Pursuant to 40 CFR 122.26(b)(14), PFS would be required to obtain an NPDES permit to protect surface waters from pollutants that could be conveyed in construction-related storm water runoff and would be required to prepare a Stormwater Pollution Prevention Plan.

Site access road. As discussed below, any impacts on the surface water flow system related to construction of the site access road would be small.

The site access road would connect the proposed PFSF with Skull Valley Road to allow site access for construction and operations personnel. Under normal weather conditions, and considering the BMPs that PFS would use to control erosion and sedimentation of surface flow channels, any effects on the surface water drainage system during the construction period would be small. Pursuant to 40 CFR 122.26(b)(14), construction activities for the site access road would also be subject to the terms of the required NPDES permit and PFS's Stormwater Pollution Prevention Plan.

Potential impacts to surface water quality. Potential impacts to surface water quality during construction would be small. Potential events that might cause water quality impacts include soil erosion followed by offsite transport of suspended solids and turbidity associated with storms, as well as accidental fuel spills in uncontrolled areas. Fugitive dust from site construction could be controlled to acceptable levels without using any chemicals (see Section 4.3). PFS has not indicated, nor have the cooperating agencies recommended, the use of chemicals for surface wetting activities. Therefore, water used for surface wetting and soil compaction would not likely contain any chemicals and therefore would not impact surface water.

PFS is committed to implementing BMPs (see Section 2.1.4) that include measures to prevent or minimize erosional impacts to the surface water system. In the event that extreme weather conditions should occur during construction, the possibility exists that localized soil erosion and transport could occur causing downstream channel siltation. Although such an event is unlikely, potential mitigation measures that could reduce the impact of such an event, are described below.

If an accidental spill of petroleum hydrocarbon fuel occurred while rainfall or snowmelt was causing surface flow through the site during construction, there could be an adverse impact on surface water. Protection of surface water quality under such conditions would require an emergency spill response to intercept and clean up spilled fuel, affected surface water, and soil. PFS's SPCC plan (see Section 1.6.2.1) would prescribe methods for minimizing or eliminating the potential impacts from spills.

Potential impacts related to flooding. In the unlikely event that severe flooding should occur during construction of the proposed PFSF and the site access road, moderate impacts to the surface water hydrological system could occur.

BMPs that would be used during construction of the proposed PFSF and the access road include erosion and siltation control for normal events. A severe flood event could occur during the construction phase. Such an event would likely overwhelm the BMPs measures and could result in erosion of disturbed soils or portions of embankments with deposition of the eroded materials in channels downstream of the work sites. The severity of such an impact would vary with the storm intensity. Such potential impacts are judged to be moderate because a severe flooding event would also affect adjacent areas and would likely cause erosion and channel siltation that would not otherwise occur in these areas in the absence of the proposed PFSF. Should severe flooding (i.e., from storms associated with the 100-year flood or greater) occur, eroded materials from the construction site would be commingled with the natural material transported by flood flows. This erosion would be indistinguishable from the impacts of the natural erosion processes during floods.

4.2.1.2 Water Use

Construction of the facility would have a small impact on water availability. Information provided by PFS indicates that Phase 1 construction activities would use water at rates that vary from about 57 m^3/day (15,000 gal/day) to over 690 m^3/day (182,600 gal/day) (PFS/ER 2000). Additional quantities of water would be required for the planned revegetation of disturbed areas. The volume of water needed is dependent upon the method used to revegetate the area. The water requirements will be determined during the development of a final revegetation plan. Therefore, no estimate is available at this time as to how much water would be needed for this purpose.

Most of the water used for construction activities, as much as 678 m^3/day (179,000 gal/day), would be obtained from an offsite source and would be trucked to the site for use in dust suppression, concrete mixing, and soil cement mixing. PFS has obtained information from private water suppliers that indicates the required volumes of water anticipated for project construction needs are readily available in the northern portion of the Stansbury Mountains without impact to regional water availability (PFS/RAI2 1999c).

4.2.1.3 Groundwater

The potential impacts from the proposed use of groundwater would be small. The use of onsite groundwater would vary from about 13 to 35 m^3/day (3,300 to 9,300 gal/day) (PFS/ER 2000) during Phase 1 construction. The peak groundwater use estimate would be satisfied with an onsite groundwater production capacity of about 0.025 m^3/min (7 gal/min), which is a moderate yield requirement. Figure 4.1 shows the anticipated water use levels during Phase 1 construction and shows the estimated cumulative total water use through the period. During later phases of construction (about years 3 and 7 after project initiation based on PFS's projected schedule), there would be two repeat periods when water use would increase to about 690 m^3/day (182,600 gal/day). These periods would be relatively short (2 to 3 months) and most of the water used for the later construction phases would be brought to the site from offsite sources as they would be during the Phase 1 construction activities.

There is some uncertainty as to the availability of sufficient groundwater quantity on site to meet the expected needs. The greatest uncertainty is whether the sedimentary deposits beneath the site contain enough sandy zones that are hydraulically connected to the sandy aquifer along the eastern valley margin to supply the desired water quantity. It is very likely that little aquifer recharge occurs on the site or elsewhere near the center of Skull Valley because of low annual precipitation and because surficial and near-surface deposits are silt and clay that have low permeability and inhibit downward percolation of water (Hood and Waddell 1968).

Based on analysis provided by PFS using the average water pumping rate during the project, the drawdown from a well constructed on site is not expected to extend beyond about 2.1 km (7,000 ft) from the pumped well. The nearest well to the proposed PFSF is approximately 4 km (2.5 miles) from the center of the PFSF site. The basis for PFS's analysis is interpretation of a single, short-duration test in a small diameter well on site, with a test interval approximately 8 m (25 ft) long. The analysis assumed that a production well would have a screened interval 33 m (100 ft) long and a

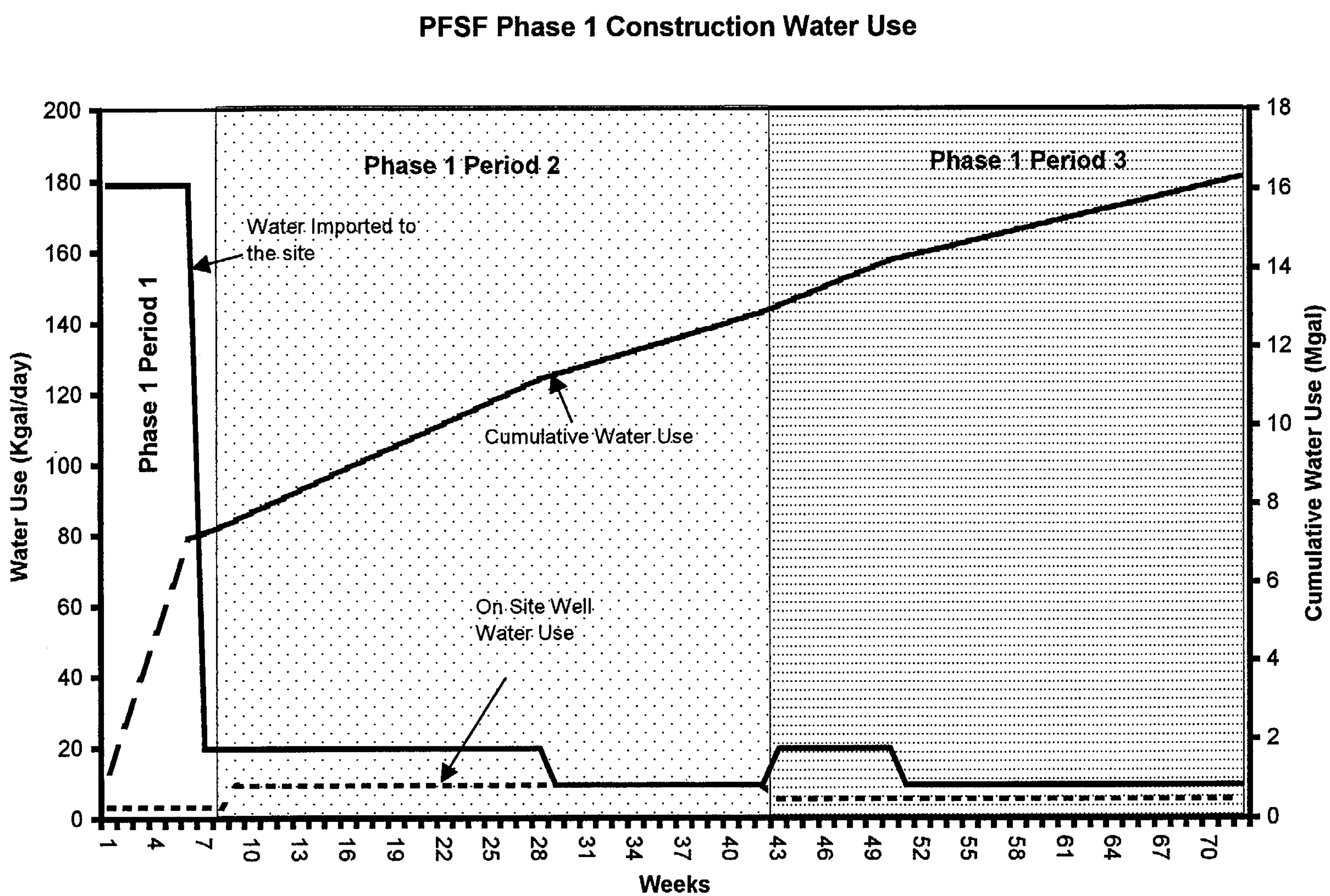


Figure 4.1. Estimated water use during construction of the proposed PFSF.

range (0.01 to 0.3) of the aquifer storage coefficient (water yield per unit of water level drawdown) was assumed. Wells drilled deeper than the previous test borings may encounter higher water yields; however, very few existing wells are located near the center of the valley to provide a basis for comparison. While PFS's analysis appears reasonable, there is not sufficient information available concerning the water producing characteristics of the central valley area to refine a potential groundwater availability analysis. Assuming PFS's evaluation is correct, it is unlikely that any existing groundwater users in Skull Valley would be affected by groundwater pumping for the facility construction. Nevertheless, in the event that onsite water quality or water quantity are inadequate, PFS has made arrangements that potable water would be obtained directly from the existing Reservation supply or from additional wells that would be drilled east of the site.

Construction of the site access road would require water for dust control and soil compaction. Water for these purposes would be acquired from offsite sources and trucked to the site for use. There would be no impact on groundwater availability in Skull Valley since all water required for road construction would be acquired offsite from private water suppliers.

Potential impacts to groundwater quality. Potential impacts to groundwater quality from the proposed PFSF construction activities would be small. Spills of liquids (such as fuels) on the PFSF site during facility and access road construction activities could potentially have an adverse impact on groundwater quality if the spills were very large and if no mitigating cleanup actions were taken. A large fuel spill would be required to adversely impact groundwater quality at the site because the groundwater table is approximately 38 m (125 ft) below the ground surface and soil retention would hold up the liquid. Soils in central Skull Valley are silty soils and percolation of spilled liquids would not be extremely rapid. Furthermore, PFS is required to have an SPCC plan (see Section 1.6.2.1), and such a plan would prescribe methods to mitigate any potential impacts to groundwater from fuel leaks or spills.

4.2.2 Impacts During Operations at the Preferred Site

This section discusses potential impacts to the hydrological system, including the surface water flow system, water use, and water quality during operation of the facility.

4.2.2.1 Surface Water

This section discusses potential impacts to the surface water flow system during operation of the facility. Potential impacts related to the facility and the site access road are discussed separately below.

Facility operation. Potential impacts to surface water during facility operation are expected to be small. Under normal conditions there is no surface water flow in the vicinity of the proposed PFSF site. As discussed in Section 4.2.1, the presence of the facility would alter some of the dry washes that normally carry stormwater and snowmelt water across the site area. Normal flows that would occur upslope of the facility would be diverted around the site by the flood diversion berm and would flow into a single existing natural runoff channel near the northwest corner of the facility. Small changes in the channel may occur as a result of concentrating flows from several pre-existing channels into one. Drainage channels along the flood protection berm would be stabilized and lined with rock to reduce flow velocity and prevent scouring.

The proposed PFSF is designed and intended to be operated as a zero release facility, thus, no effluents are expected. Operation of the proposed PFSF would not create excess runoff that would have adverse downstream impacts. There would be no discharge of water to the land surface. All surface runoff generated within the 40-ha (99-acre) area from precipitation events up to, and including, the 100-year storm event would be collected in a surface water runoff basin for infiltration and evaporation. Even if site runoff were not collected, there would be no adverse impact to flooding at the watershed scale because of the very small size of the proposed PFSF [40 ha (99 acres)] in comparison to the overall Skull Valley drainage basin area [181,000 ha (448,000 acres)]. The area that is developed for the project is 0.02 percent of the total Skull Valley watershed area.

Parking lots adjacent to the buildings at the proposed PFSF would occupy a total area of about 1.5 ha (3.5 acres) (see Section 2.1.1.2). Surface water runoff from these parking lots would be small in comparison to existing runoff from the proposed project area, and would therefore have a small impact on natural drainage patterns.

Site access road. Under normal conditions, the presence of the site access road would have a small impact on surface water flows. PFS's site access road design includes culverts installed at wet-weather surface water flow channel crossings that would accommodate flows up to and including the 100-year flood [about 6.9 cm (2.7 inches) in a 24-hr period)]. PFS has specified design criteria for placement of energy dissipating materials at culvert outlets for elements of the transportation system to prevent or minimize downstream erosion or scouring below culverts. Since the same criteria were used for the site access road, there would be no channel erosional impacts related to flows through culverts along the site access road from normal seasonal runoff.

4.2.2.2 Potential Impacts Related to Flooding

As discussed below, the presence of the proposed PFSF and site access road would incrementally increase the impacts resulting from extreme flood events. During flood conditions, the presence of the proposed PFSF would create only minor, incremental impacts beyond what would occur if the facility were not constructed. These impacts are judged to be small for the proposed PFSF and the site access road and are discussed below.

As described in Section 4.2.1, the PFSF design incorporates an upslope flood diversion berm that would divert surface water runoff from the upland area toward Hickman Knolls and flood waters from drainage channels to the southwest. The diverted flow would be discharged into an existing arroyo near the northwest corner of the facility.

A flooding analysis was performed by PFS to determine if the proposed PFSF would be protected from floodwaters during a PMF. The PMF is the maximum credible flooding event that could occur in an area, and the analysis considers both local runoff and flooding that could result because of runoff from areas upstream in the surface water drainage basin. The PMF is a flood of severity greater than the 100-year flood. The flood analyses performed included the expected PMF water elevations in the site vicinity for the post-construction condition (access road embankment, railroad grade, PFSF facilities, and flood control berms assumed to be in place). Analyses were performed for both a general storm condition [about 31 cm (12.2 inches) of rainfall in a 72-hr period] and for a locally intense storm [about 27 cm (10.6 inches) in 6 hours]. More surface water runoff would be produced by the general storm than by the intense local storm. The flood analysis showed that the proposed

PFSF would be protected from flooding during the PMF due to the presence of earthen berms uphill and at road and railroad access points.

A severe flood event could result in moderate impacts to surface water drainage channels adjacent to the proposed PFSF. Surface drainage features on the proposed PFSF site are shallow dry washes that carry occasional runoff from thunderstorms and snowmelt. Some of these features would be intersected by the facility, and upslope surface water in the washes would be diverted around the facility perimeter by the flood diversion berm. PFS's facility design description states that rip-rap would be used to prevent erosion of the berm during periods of flow. Although not identified in the design descriptions, a drainage swale would probably develop through natural flow and erosion processes upslope of the berm (outside of the facility area). Without adequate energy dissipating design, concentration of all natural upslope flow along the toe of the berm with discharge into a single, unprotected wash could cause erosion near the proposed PFSF with channel sedimentation downstream. Potential impacts could occur for storm event less severe than the 100-year event. PFS' proposed design includes flow routing and energy dissipating features in the design of the flood diversion berm that would mitigate this potential moderate impact.

The access road crosses Skull Valley and would be affected by severe flooding. The culvert systems at seven channel crossing locations along the site access road would be designed by PFS to accommodate water volumes associated with the 100-year, 24-hour storm event. The storm intensity associated with this frequency event would result in about 6.9 cm (2.7 inches) of rainfall within a 24-hour period. [The PMF analysis was applied to the site access road and the analysis determined that the roadway would be inundated by 0.75 to 1 m (2.5 to 3.2 feet) of water. This would temporarily prevent access to or egress from the facility. Such flooding would also likely cause some erosion of the road embankment requiring repairs prior to returning the road to service. PFS's facility design incorporates an earthen berm at the western end of the access road to protect the PFSF from potential flooding by waters that would overtop the access road embankment and could potentially be diverted into the facility area.]

Due to the presence of the access road embankment, during severe flood events some ponding of surface water could occur upstream of the access road. Such effects would be temporary and would include sediment deposition upstream of the road embankment that could alter the existing drainage features. Impacts could occur to vegetation in areas affected by short-term ponding and silt deposition. Erosion of soil from the road embankment or related to channel scour may cause local changes in the channel morphology downstream of the access road through siltation or scouring. Revegetation of embankments and other cleared areas is proposed by PFS and would reduce the potential impacts of channel siltation.

4.2.2.3 Water Use

PFS's estimate of operational groundwater use is expected to be less than 0.038 m^3/min (10 gal/min) (PFS/ER 2000). Based on PFS's analysis of the site groundwater conditions (see Section 4.2.1.3), it is anticipated that onsite wells would be capable of supplying the amount of water required during facility operations. In the event that onsite water quality or water quantity are inadequate, potable water would be obtained directly from the existing Reservation supply wells or from additional wells that would be drilled east of the site where the aquifer yield may be greater.

4.2.2.4 Groundwater

Potential impacts to groundwater quality from operation of the facility would be small. Components of the facility that could have the potential to interact with the groundwater system include the surface water detention basin, the two planned septic systems with leach fields, and onsite vehicle fuel tanks.

Impacts to groundwater from surface infiltration at the storm water detention basin or from a shallow septic system depend on the depth that percolation extends into the soil. Infiltration capacity of site soil is relatively low (see Sections 3.1 and 3.2) and natural rainfall and recharge is so low that the groundwater budget estimates for Skull Valley assign no recharge to the aquifer in the valley floor of central and northern Skull Valley (Hood and Waddell 1968). The storm water detention basin will be a 3-ha (8-acre) basin with 10:1 (horizontal:vertical) embankments with crested wheat grass vegetative cover. During periods when water is present in the basin, a combination of vertical percolation, lateral seepage into the embankments, and evaporation will gradually reduce the water impounded water volume. PFS does not expect the detention basin to contain water except after severe storms and does not expect any contaminants to be found in water in the basin. Infiltrating water beneath the basin would gradually migrate to the north in the downslope direction and would probably dissipate in the soils above the water table. Evapotranspiration would pull the moisture back to the land surface and into the atmosphere. Such added moisture in the soils near the facility could stimulate prolonged plant growth during periods after major storm events. PFS has indicated that it would use pumps to remove long term standing water from the basin to prevent stimulating plant growth and attracting wildlife (PFS/RAI2 1999e). PFS would sample and analyze water from the basin when water is present to determine if contaminants are present (PFS/ER 2000). Since no contamination is expected in the detention basin and relatively little water is expected to be present in the basin, then there would be no impact on groundwater quality.

The quantity of water that would be used by workers is estimated to be about 6 m^3/day (1500 gal/day) (see PFS/ER 2000). This water volume is similar to the volume of water used at a typical light industrial facility with 24-hour per day security personnel. Two septic systems and leach fields are planned for the facility and, pursuant to 40 CFR 144.26, Underground Injection Control registration with EPA Region VIII would be required. To prevent process-related liquids from entering the septic systems, the facility design includes segregation of drains between process areas and areas that drain to the septic systems (PFS/ER 2000). Soil characteristics in the area have a relatively low infiltration capacity. Similar to the water in the detention basin, the added soil moisture from the septic systems, assuming low volume loading, may never reach the groundwater table at depth beneath the site. Moisture from the leach fields would spread in the soil as percolation occurred, and the added shallow soil moisture could promote growth of vegetation in the vicinity of the septic systems.

Above-ground fuel tanks would be used at the site to store vehicle fuel. PFS's SPCC plan (see Section 1.6.2.1) would prescribe methods for properly responding to fuel leaks or spills to minimize fire hazard or contamination of groundwater in accordance with EPA regulations (40 CFR Part 112).

4.2.3 The Alternative Site (Site B) in Skull Valley

Under normal conditions, the potential hydrological impacts at Site B in Skull Valley would be small and would be similar to the impacts discussed for use of Site A. There are no distinguishable differences in the surface water or groundwater characteristics of Sites A and B. Both sites have shallow dry washes that carry ephemeral surface water runoff. Since Site B is immediately upslope from Site A some of the same drainage features cross both sites. Assuming that the facility configuration would remain the same on Site B as it would be on Site A, the expected flooding effects would be the similar, although flood heights may be slightly lower at Site B since it is at a slightly higher elevation.

Soil and groundwater conditions are expected to be the same at Site B as they are at Site A and potential impacts expected at Site B would be small.

4.2.4 Mitigation Measures

Several small to moderate impacts related to the hydrologic system at Skull Valley have been described. PFS has identified mitigation measures for some, but not all, of the potential impacts. The following discussion highlights additional mitigation measures that could further reduce potential impacts of construction of the facility.

One potential impact to surface water from construction is related to the construction sequencing for the PFSF. Construction of the southeastern storage pad, and perhaps other upslope facilities, prior to construction of the detention basin (which could be configured as a sedimentation basin during early construction) creates a potential for erosional/depositional impacts in drainageways downslope of the site during the early periods (weeks) of Phase 1 construction. PFS would reduce this impact if the detention basin was the first feature constructed on the site. All construction area runoff could be routed into the basin to prevent local channel degradation.

Since there is some uncertainty regarding the potential impact of on-site pumping on neighboring water supply wells, PFS should either monitor water levels in adjacent wells or otherwise monitor the effect on area groundwater levels to verify the small impact predicted. In the event that neighboring groundwater users were adversely affected, PFS should mitigate this impact by exercising the existing option of using an existing supply well located approximately 4 km (2.5 miles) to the east of the site or construct wells in a higher yield portion of the aquifer.

The cooperating agencies recommend that PFS be required to develop a monitoring program to determine if the wells nearest the proposed PFSF are adversely impacted from groundwater withdrawal associated with the construction and operation of the proposed PFSF (see Section 9.4.2). The proposed monitoring program must include one of the methods described above.

4.3 Air Quality

This section discusses impacts from site preparation and construction of the PFSF. It also includes an assessment of potential air quality impacts in the context of NAAQS (40 CFR Part 50). The greatest expected air quality impacts would involve airborne particulate matter arising from the extensive earthwork involved in site preparation and construction. Existing literature provides estimates of construction-related particulate emissions in terms of mass generated per unit area per unit time. Emissions from earth disturbance and from exposed loose dust during hours when earth disturbance would not occur were included in the analysis; emissions from construction vehicles and from a concrete batch plant located within the proposed facility during the construction period were also included. Emissions parameters have been input to standard Gaussian air dispersion models that provide estimates of increases in atmospheric concentrations (mass per unit volume) of contaminants at various distances from the site of the proposed PFSF. Pollutant dispersion models approved by EPA have been used. Modeled increases in particulate concentrations have been added to measurements of existing background concentrations in the region (as taken from data available on EPA's web site), and the sums have been compared to NAAQS (40 CFR Part 50) to check for particulate concentrations resulting from the proposed construction activities potentially exceeding the standards. A similar evaluation has been performed for construction activities associated with the proposed Skunk Ridge rail route and the ITF near Timpie (see Section 5.3.1).

Because air emissions associated with routine operations would be small, the evaluation of operational impacts associated with operations is brief.

4.3.1 Construction Impacts at the Preferred Site (Site A)

During construction of the proposed PFSF, temporary and localized increases in atmospheric concentrations of nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. Because a maximum of 10 equipment operators are expected to be on site at any one time (PFS/ER 2000), emissions from construction-related equipment are expected to be small. However, due to the large extent of the disturbed area, particulate matter in the form of fugitive dust emitted from excavation and earthwork could lead to appreciable local increases in atmospheric concentrations of PM-10. Fugitive dust would have the greatest influence on air quality during construction.

Estimates of PM-10 concentrations from construction-related fugitive dust originating at the proposed PFSF site were obtained from air-dispersion modeling, and were added to existing (background) concentrations to obtain estimates of total airborne PM-10 concentration for comparisons with the NAAQS. The NAAQS were established to protect human health and welfare with an adequate margin of safety (40 CFR Part 50).

To obtain upper-bound estimates of construction-related PM-10 concentrations, the EPA-recommended Industrial Source Complex Short-Term (ISCST3) air dispersion model (EPA 1995) was applied to an assumed construction area of maximum extent. This area totaled 30 ha (75 acres), and included: the entire detention basin, the southwestern portion of the diversion berm, the southeastern pad area, all but the northwest portion of the boundary area, the health physics building, the canister transfer building, and the concrete batch plant. This configuration was chosen to represent a maximum area that would likely be undergoing heavy construction at any single time; it is unlikely that any realistic construction area would produce higher PM-10 concentrations in any direction from Site A.

On the basis of EPA-recommended data (EPA 1985), an average emission factor of 1.02 g/ha/s (1.2 tons/acre/mo) of total suspended particulate was used to calculate fugitive dust emissions. Of these emissions, 30 percent of the mass is expected to consist of PM-10 (Kinsey and Cowherd 1992). Because PFS has stated that sprinkling of water would be performed during construction to control dust (PFS/ER 2000), fugitive dust emissions were reduced in the model by 50 percent (EPA

1985, 1988). However, no such emission reductions were assumed for the concrete batch plant or for loose dirt subject to wind erosion during off hours.

Construction was assumed to occur continuously during a normal 9-hour shift (8:00 A.M. to 5:00 P.M. each day). The modeled PM-10 concentrations during construction were added to the background concentrations given in Table 3.2 to estimate total impacts for comparison with the NAAQS; however, it should be noted that the background PM-10 concentrations given in Table 3.2 were obtained from Magna, which is well to the northeast of the proposed PFSF site (see Figure 1.1). Therefore, the impacts from some large existing PM-10 sources within 50 km (32 miles) of the site, and particularly sources to the southwest of the site (e.g., Dugway Proving Ground), would not be fully represented in the background data from Magna. To account for this, the effects of emissions from other large sources in the area (e.g., Dugway Proving Ground, Tooele Army Depot) on concentrations near the site of the proposed PFSF were included in the modeling without any compensation for obstructions that exist, such as mountain ranges between these other sources and the proposed PFSF site. These results were added to the background concentrations obtained from the air quality monitoring data at Magna to provide a conservative estimate for background.

Eight years (1984–1991) of Salt Lake City meteorological data (available from EPA at URL http://www.epa.gov/ttn/scram/t25/htm) were used in the modeling. Salt Lake City is the nearest location at which quality-assured hourly meteorological data have been archived over a period of several years. The two years (1997 and 1998) of meteorological data from near the Pony Express convenience store located on Skull Valley Road about 3.2 km (2 miles) southeast of Site A were also used, providing a total of 10 years of meteorological data; results from the two sites were similar to each other.

Atmospheric concentrations of PM-10 were modeled at 125 locations (receptors) within 3.5 km (2.2 miles) of the center of the proposed storage-pad area but outside the immediate area of the proposed facility. The outermost circle of receptors passes close to the nearest residences; no locations closer to the proposed PFSF were identified as places where a member of the general public would likely spend appreciable fractions of any given day. The innermost circle of receptors passes close to the nearest publicly-owned land, about 1,100 m (0.7 mi) northeast of the center of the proposed PFSF.

Table 4.2 shows the results of the above analysis; construction of the proposed facility is not expected to lead to any exceedances of NAAQS for PM-10 at the nearest residences, even if construction activity is as intensive as that assumed in the modeling. Moreover, the modeled contribution of construction activities to total PM-10 concentrations is small compared to the background concentration values.

The highest 24-hour average concentration expected at the location of the nearest residence due to the combined influences of modeled background sources and site construction is 114 $\mu g/m^3$. The modeled contribution of off-site sources was minuscule (i.e., less than 0.1 $\mu g/m^3$) due to the absence of large PM-10 sources, other than site construction, in the upwind direction on days when the wind is transporting PM-10 from the construction site toward the nearest residence. Therefore, the maximum modeled 24-hour PM-10 concentrations at the nearest residence almost exclusively originate from disturbance at Site A.

Table 4.2. Effects of site construction on PM-10 concentrations at the nearest residences

Averaging period	Contribution to PM-10 concentration (as modeled): Construction	Contribution to PM-10 concentration (as modeled): Background[a]	Total modeled concentration	NAAQS	Total modeled concentration as percent of NAAQS
24-hour	22 $\mu g/m^3$	92 $\mu g/m^3$	114 $\mu g/m^3$	150 $\mu g/m^3$	76
Annual	2 $\mu g/m^3$	22 $\mu g/m^3$	24 $\mu g/m^3$	50 $\mu g/m^3$	48

[a]The modeled effect of PM-10 emissions from Dugway Proving Ground is included.

Because NAAQS would not be exceeded at the nearest residence, the expected air quality impacts from the preparation and construction of Site A would be small.

4.3.2 Impacts During Operations at the Preferred Site

Emissions from daily operations of the proposed facility would arise primarily from (1) a switchyard locomotive; (2) a small emergency generator, vehicles for transportation of material within Skull Valley, guard and security patrol vehicles, commuter traffic; and (3) space-heating furnaces. Operational emissions would be intermittent and would not be expected to contribute to an exceedance of any ambient air quality standard.

4.3.3 The Alternative Site (Site B) in Skull Valley

With respect to the potential for impacts to air quality, there is no clearly distinguishable difference between the preferred site (Site A) and the alternative site (Site B) on the Reservation. While Site B is slightly closer than Site A to the nearest residences, the highest construction-related PM-10 concentrations at those residences would be slightly less than for Site A. This is because the worst dispersion conditions when the wind is moving toward those residences from Site B are not as unfavorable as when the wind is from the direction of Site A.

4.3.4 Mitigation Measures

Sprinkling the disturbed area with water to reduce fugitive dust is the single best means of reducing construction-related emissions. This has already been accounted for in the construction planning and in the foregoing analysis. In addition, operation of construction equipment and related vehicles with standard pollution control devices and maintenance of this equipment in good working order would minimize emissions from these sources. Other methods of minimizing the potential impacts from dust emissions include designating personnel to monitor dust emissions and to order increased surface watering as necessary, and minimizing dust emissions from the concrete batch plant through the use of water sprays and/or shrouding or enclosing material transfer points and aggregate storage piles. The cooperating agencies recommend that PFS develop a program to control fugitive dust during construction (see Section 9.4.2). The program should include one or more of the methods described above, as appropriate, to control and reduce construction related emissions.

4.4 Ecological Resources

The potential impacts of site preparation, construction, and operation on ecological resources are evaluated and discussed in this section. Areas of potential concern include construction and operation activities that would disturb or remove vegetation or animals either temporarily or permanently. Since the existing drainages in the area of the preferred site are ephemeral and support no permanent aquatic communities, construction activities would have negligible direct and indirect impacts on aquatic biota, and they are, thus, not considered in this section. Direct losses from land disturbance are quantified by determining the amounts of habitat lost as a result of construction activities. Potential impacts on species of special concern, as identified in Section 3.4.3, that are found to reside on or use the proposed site are also evaluated in Section 4.4.3.

4.4.1 Construction Impacts at the Preferred Site (Site A)

Table 2.4 shows the amount of land that would be cleared for the proposed PFSF. The OCA for the proposed PFSF (only part of which would be cleared) would consist of about 330 ha (820 acres), which is less than 0.3 percent of Skull Valley's approximately 108,400 ha (271,000 acres). PFS proposes to use herbicides to maintain the 40-ha (99-acre) restricted-access area clear of vegetation. The impacts of using herbicides during operation of the proposed PFSF are addressed in Section 4.4.2.

4.4.1.1 Vegetation

Direct impacts on vegetation of constructing the facility (including the access road) at the preferred site would include removing existing vegetation, replacing some of it for the life of the project with structures and ancillary facilities such as the access road, and replanting other parts of the disturbed areas with some mixture of native and non-native plant species. The direct impact of clearing vegetation for the proposed action would be small, as the area to be cleared for the life of the project at the preferred site contains no unique habitats and amounts to less than 0.1 percent of the land area of Skull Valley. Planting native species on those areas to be cleared that are currently dominated by cheatgrass would have a somewhat beneficial impact on vegetation and biodiversity; but this impact would be small in relation to the entire area of Skull Valley.

Indirect effects on vegetation of constructing the facility (including the access road) at the preferred site would include modifying wildlife habitat and introducing a non-native species, crested wheatgrass (*Agropyron cristatum)*, as a fire barrier, thus altering the susceptibility of the area to wildfires. In addition, ground water withdrawal and fugitive dust from construction could have indirect effects on vegetation. These impacts would all be small.

Construction of the proposed PFSF at the preferred site, including the access road, would require clearing vegetation and grading soil from approximately 94 ha (232 acres) of desert shrub/saltbush vegetation community within the 330-ha (820-acre) OCA and the 82-ha (203 acre) access road right-of-way. Most of the vegetation that would be cleared is dominated by non-native species such as cheatgrass (see Section 3.4.1). About 57 ha (140 acres) would remain cleared for the life of the proposed PFSF.

PFS has stated that it would revegetate approximately 37 ha (92 acres) after construction. The approximately 28-ha (68-acre) fire barrier would be planted with crested wheatgrass, and the remaining cleared area [about 9 ha (24 acres)] would be planted with native species. The revegetation plan for the PFSF site would be developed during construction in consultation with the Skull Valley Band and BIA (PFS/RAI2 1999). It would include monitoring during the life of the facility to ensure successful vegetation establishment. [See Section 4.4.5 for a discussion of mitigation measures (e.g., irrigation) to ensure success of the revegetation program.]

Subdividing large areas dominated by annuals such as cheatgrass by planting less flammable species in borders or greenstrips can help both to contain large fires and to aid in fire suppression. Because fires currently spread rapidly through Skull Valley due to the extensive amounts of cheatgrass growing there, the use of crested wheatgrass in the fire barrier might reduce the extent of fires.

Crested wheatgrass, which PFS is planning to plant in a strip around the proposed facility as a fire barrier, is a native of east and central Asia. It has been widely planted in the United States and is often used in the Intermountain Region for revegetating disturbed lands (Ahlernslager 1988). It is considered to be fire resistant because some observers report that wildfires move only two to three meters (a few feet) into an area seeded with it (Ahlernslager 1988). While the plants burn quickly, they are only slightly damaged by fire. However, the response to fire varies with the season and intensity of the burn. The species is tolerant of fire when dormant, and several studies have shown that its growth is greatly favored by late summer fires.

When used in revegetation, crested wheatgrass is typically seeded alone and is one of the easiest grasses to establish on semiarid rangeland sites (Ahlernslager 1988). In Utah it grows on disturbed or revegetated sites along roads and on open slopes in salt desert shrub to ponderosa pine communities (Albee et al. 1988). It is an excellent seed producer that in many instances spreads readily by seed and is capable of invading surrounding habitats.

Although it provides permanent, self-sustaining vegetation, the use of crested wheatgrass has generated controversy (Christian and Wilson 1999). The relative stability of monocultures of crested wheatgrass can retard the succession of native vegetation and result in a loss of wildlife habitat in areas seeded totally in this one species. However, even when seeded in a mixture with other plant species whose presence may be desirable in mixed plantings, crested wheatgrass soon spreads and becomes the dominant species due to its competitiveness and persistence. Because it is a superior competitor, it is incompatible with many native grasses, forbs, and shrubs (Ahlernslager 1988). Some rhizomatous native wheatgrasses (e.g., *Pascopyrum smithii, Elymus lanceolatus*) have competed satisfactorily with it in some areas, but it out competes most species, including bluebunch wheatgrass (*Pseudoroegneria spicate*) and big sagebrush. Thus, when planted in Skull Valley, it might spread outside the area where it is planted and compete with native vegetation growing there.

Revegetation with native species would have a small positive impact on vegetation, while planting a fire barrier with crested wheatgrass would replace an area dominated primarily by one non-native species with another non-native species. Planting crested wheatgrass would have a small impact on vegetation because it is no more invasive than the cheatgrass already there and does provide some protection from fire that may occur in the area. Mitigation measures that would result in a larger positive impact from revegetation are discussed in Section 4.4.5.

Withdrawal of groundwater to support construction of the facility would have a small impact on vegetation. (See Section 4.1.2 for a discussion of groundwater use for the proposed facility.) Plants from arid environments tend to have deeper roots than those growing in other ecosystems; the maximum average rooting depth for vegetation in the desert biome has been reported to be 9.5 ± 2.4 m (31 ± 8 ft) (Canadell et al. 1996). The depth to the perennial water table in Skull Valley is about 38 m (125 ft) (Section 3.2.2), much deeper than plant roots usually grow. Thus, withdrawing groundwater for the proposed facility would have a small impact on vegetation.

Surface water runoff from the restricted-access area (discussed in Section 4.2.1) would be routed to a detention pond. Thus, there would be only a small impact to vegetation in the surrounding undisturbed habitats from runoff from impermeable surfaces constructed within the project area.

Fugitive dust would be generated during construction, as discussed in Section 4.3.1. The small, short-term, incremental amount of the dust that would be generated from construction activities is expected to only have a small impact on vegetation since vegetation in arid environments is not sensitive to dust.

4.4.1.2 Wildlife

The proposed construction activities would result in the temporary disturbance of 94 ha (232 acres) and the permanent disturbance of 57 ha (140 acres) of desert shrub/saltbush ecosystem. This disturbance would reduce habitats for wildlife species such as jack rabbits, small mammals, and birds. Certain species such as mule deer and pronghorn antelope may be forced to change their movement patterns due to the presence of the restricted-access area fence. As discussed below, all of these potential impacts are expected to be small.

During construction, wildlife, such as ground squirrels, kangaroo mice, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as the Skull Valley pocket gopher and burrowing owl. This reduction of animals and wildlife habitat would have a small negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. However, the permanently disturbed area is expected to have only a small negative impact, as less than 0.1 percent of Skull Valley would be disturbed due to the construction of the proposed facility.

The natural revegetation of 37 ha (92 acres) would create a small amount of improved wildlife habitat. These areas may increase habitat for burrowing owl, gopher, and small mammal which may also support some prey species and help replace those lost or displaced by construction. In addition, along some of the proposed roads and the edges of construction areas, the soils may be disturbed (i.e., loosened) in such a way that habitat for burrowing mammals and owls might be created.

Currently there is a livestock fence on the northern and western borders of the Reservation. The proposed action calls for the fencing of the OCA [approximately 330 ha (820 acres)]. This fence would be a typical range fence of approximately 1.2 m (4 ft) high and would not inhibit the movement of wildlife species. Only approximately 40 ha (99 acres) of this area (i.e., the restricted-access area) would be fenced such that it would restrict wildlife movement. Wildlife use of and movement through the restricted-access area would be limited, and the presence of the facility may inhibit the movement of range wildlife such as mule deer and pronghorn antelope. Some wildlife may change their movement patterns to negotiate around the restricted-access area fences. This should not have a significant impact on mule deer or pronghorn antelope populations as the western portions of the Reservation (i.e., areas to the west of Skull Valley Road) have not been identified as critical fawning or wintering areas for either species (BLM 1988a). Actually, the closest critical habitats for pronghorn antelope can be found to the north of the proposed PFSF, 10 km (6 miles) northwest of Delle and to the south of the proposed PFSF, approximately 40 km (25 miles) south of the Reservation. Critical mule deer habitat is present to the east of Skull Valley Road and is shown on Figure 3.8. The range fence around the OCA would restrict the movement of cattle. However cattle will be permitted to graze within this area at the discretion of the Skull Valley Band and PFS.

The access road between Skull Valley Road and the proposed facility would not be fenced. The proposed fence nearest to Skull Valley Road would be around the OCA at a distance of 3 km (2 miles) away. Because the access road would not be fenced, there would be no forced changes to wildlife movement patterns near Skull Valley Road.

Noise impacts from construction would have a temporary adverse effect on area wildlife. This effect is expected to be small, as wildlife sensitive to noise intrusions are those which are nesting or raising young. The area in the vicinity of the proposed construction does not provide good nesting sites for raptorial birds or critical wintering or fawning areas for deer or antelope (BLM 1988a; UDWR 1997a). Smaller mammals and birds may be affected temporarily, but many of these animals, such as burrowing owls, frequently can adapt to human activity.

4.4.1.3 Wetlands

Because there are no wetlands on or near the preferred site for the proposed PFSF, there would be no direct impacts to wetlands from construction. The only other potential impact to wetlands would be from increased recreational use of the area in the northern part of Skull Valley around Horseshoe Springs by construction workers and their families. This impact should be small (see Section 4.8.3).

4.4.2 Impacts During Operations at the Preferred Site

4.4.2.1 Vegetation

Direct and indirect impacts of operation of the proposed PFSF on vegetation should be small. During operation of the proposed PFSF, no additional disturbance of soils or vegetation would occur beyond that already discussed above for construction of the proposed PFSF. Hence, no further direct impacts from the disturbance of soils or vegetation should occur.

Indirect impacts to vegetation during operation of the proposed PFSF could result from air emissions and groundwater withdrawal. During the operational lifetime of the proposed PFSF, only minor atmospheric emissions would be expected (see Section 4.3.3). These emissions would be at levels unlikely to impact vegetation. Groundwater use for the proposed PFSF is discussed in Section 4.2. The level from which groundwater would be drawn by wells is much below the area where plant roots would reach. Thus, withdrawal of groundwater during operation of the proposed PFSF should not impact vegetation.

PFS has indicated that it may use herbicides to assist in maintaining the restricted-access area free of vegetation. EPA's labeling requirements control when and under what conditions herbicides can be applied, mixed, stored, loaded, or used (e.g., wind speed, relatively humidity, air temperature, chemical persistence, time since last rainfall). By following these requirements, PFS would ensure that the impact of herbicides on non-target vegetation during the operational lifetime of the facility would be small.

4.4.2.2 Wildlife

The proposed operation of the proposed PFS project would result in a number of potential impacts to wildlife. Roaming animals may need to adjust their movements and migration patterns from time to time due to the increase in traffic in the area. Wildlife may be attracted to the storage casks, buildings, landscaping plants and trees, power lines and poles, and light posts of the facility. Birds, mammals, and reptiles may be attracted to the cask storage area, as this area will be warmer than the ambient air in the winter. Birds may be attracted to the facilities including the cask storage area for perching and potential nesting because of the limited perching and nesting sites now available in the vicinity. In all these cases, with the application of proper mitigation measures as discussed below in Section 4.4.5, impacts to wildlife populations are predicted to be small.

The new power lines constructed to connect the proposed PFSF site with existing electrical service along Skull Valley Road would have the potential to impact birds. Raptors and other birds with large wingspans could be electrocuted by simultaneously touching adjacent power lines. The new power poles could be attractive to raptors as perching sites, and contact with the electrical connectors could likewise harm the birds. Also, collisions with the power lines could affect birds. The new power lines and power poles should be designed in such a manner as to minimize or avoid these types of impacts (see Section 4.4.5).

During the operation of the proposed PFSF, because construction activities would be for the most part completed, minor impacts from on-site transportation would be expected. Truck traffic will cause roaming wildlife to sometimes adjust their movements and migration patterns. However, these impacts are expected to be minor.

As part of the construction of the proposed PFSF, long stretches of power lines and poles will be constructed. The longest stretch proposed would be along the access road that would connect Skull Valley Road to the proposed PFSF. This road, as planned, is to be approximately 4 km (2.5 miles) long. The introduction of typical power poles poses a threat of electrocution to large raptorial species, such as hawks and eagles. With proper application of accepted raptor protection practices (see Section 4.4.6), this impact would be expected to be small.

During the operations of the proposed PFSF, measurable radiation will be present in and around the storage cask area. Doses have been estimated for the HI-STORM storage cask system at the boundary of the restricted-access area. Assuming that the storage cask area is at maximum capacity (i.e., 4,000 casks present), the radiation doses for the system should pose no threat to wildlife using the habitats adjacent to the fence. Under a maximum exposure scenario of 24 hours a day for 365 days a year, doses to wildlife at the fence around the northern boundary of the restricted-access area would be 0.05 Sv/yr (5 rem/yr) for the HI-STORM system (PFS/ER 2000). PFS has established a radiation dose criterion. PFS believes the radiation dose criterion of 1 Sv/yr (100 rem/yr) is adequate to protect wildlife (PFS/RAI1 1999). NRC has no standard for radiation doses to wildlife. The 1 Sv/yr (100 rem/yr) rate is the lowest dose rate at which harmful effects of chronic irradiation have been reliably observed in sensitive species. Harmful effects could include impairment of cell development and growth (NBS 1994; PFS/RAI1 1999). The International Atomic Energy Agency

(IAEA) reports that for mammals, 10 mGy/day (1 rad/day) represents the threshold at which slight effects of radiation become apparent in those attributes (e.g., reproductive capacity) which are of importance for the maintenance of the population. For birds, the IAEA reports that it is more difficult to study the chronic effects of radiation because of their mobility. The IAEA reports that a study showed that the breeding of swallows and wrens exposed to 0.7 to 6 mGy/day (70 to 600 mrad/day) appeared essentially normal (IAEA 1992). The estimated doses to wildlife from operation of the proposed PFSF are well below the PFS and IAEA criteria. Therefore, only small impacts are expected to wildlife that use habitats near the boundary of the restricted-access area.

Potential impacts to wildlife may occur from exposure to radiation if animals intrude into the storage cask area. Wildlife that could be potentially exposed to radiation from the storage casks include perching birds, nesting birds, birds and mammals seeking warmth and shelter in winter (as the casks will be above-ambient temperatures in winter), and reptiles.

For the HI-STORM cask system, the highest levels of radiation would come from contact with the bottom vents (see Table 4.3). In order for an animal to receive a dose that exceeds the 1 Sv/yr (100 rem/yr) criterion, that animal would have to be in close proximity to the bottom vents 78 percent of the time during the course of a year. This scenario is unlikely. In addition, vents for the proposed storage casks would be covered with wire mesh to discourage wildlife use and habitation of these areas. The already low likelihood of an animal spending enough time near the vents to receive a dose that exceeds 1 Sv/yr (100 rem/yr) would be decreased further by an active monitoring plan (see Section 4.4.5) to prevent animals from being in the cask storage area. Impacts to wildlife due to radiation exposure via the bottoms vents of the casks is therefore predicted to be small.

Table 4.3. Calculated doses for wildlife near the HI-STORM storage cask

Location	Dose rate[a] [Sv/hr (rem/hr)]	Approximate exposure time (in hours per year) required to exceed 1 Sv/yr (100 rem) per year
Bottom vents	0.15 mSv/hour (15 mrem/hour)	6,700
Top surface	0.05 mSv/hour (5 mrem/hour)	N/A

Note: N/A indicates that exposure for one full year (8,760 hours) will not exceed 1 Sv (100 rem).

[a]Dose rates taken from Table 4.2-2 in PFS/SAR 2000.

Radiation exposure from the top surface of the HI-STORM storage cask system is low. Even if an animal (e.g., a perching hawk) were to sit on the surface of a cask 100 percent of its life for the duration of one year, the doses received by that animal would be well below the 1 Sv/yr (100 rem/yr) criterion [i.e., 0.438 Sv/yr (43.8 rem/yr)]. Impacts to wildlife exposed to radiation from the top surface of the HI-STORM cask system are expected to be small.

Nocturnal wildlife species such as nighthawks and bats may forage on insects attracted to the lighting at the proposed PFSF. Wildlife species could also use lightpoles for nesting platforms. Since these light poles are to be approximately 35 m (120 ft) high, they would be a sufficient distance away from the storage casks to ensure that birds would not be exposed to radiation doses above the 1 Sv/yr (100 rem/yr) criterion. If power poles, 9 m (30 ft) high, are in the vicinity of the cask storage area, birds using these poles as nesting platforms would likewise not be exposed to doses above the 1 Sv/yr (100 rem/yr) criterion. Therefore radiation impacts to animals that may be using the light or power poles in the vicinity of the cask storage area are expected to be small.

4.4.2.3 Wetlands

The area around Horseshoe Springs is a designated ACEC (BLM 1992a). This BLM designation protects and recognizes the unique, environmentally sensitive wetlands and springs found there. Indirect impacts to these wetlands could occur if an increased population in Skull Valley over the lifetime of the proposed action results in greater visitation to Horseshoe Springs and greater use of the informal camping area at Horseshoe Knolls. In 1997 this area had at least 3,475 visitor-use days (BLM 1998c). Only if visitation rose significantly beyond that level might there be a potentially negative impact.

The wetlands habitat around Horseshoe Springs is closed to OHV use year round (BLM 1992a, 1992b). On areas to the north and south of the wetlands, OHV use is limited to existing roads and trails from April 16 through November 30 and is completely closed to OHV use from December 1 through April 15. These restrictions, if effectively enforced, should protect the wetlands habitat even if an increase in the number of people in Skull Valley during the lifetime of the proposed facility results in increased recreational use of that area. However, as not many workers are projected to move into the valley (see Section 4.5), these impacts would be small.

4.4.3 Impacts to Threatened, Endangered, and Other Species of Special Concern

Section 3.4.3 describes the Federal and State listed threatened and endangered species and other species of special concern that could potentially be affected by the proposed action. Consultation with the FWS has been initiated to comply with Section 7 of the Endangered Species Act. A list of threatened and endangered species has been provided from the FWS (see Appendix B).

4.4.3.1 Plants

Direct and other impacts on special concern plant species of constructing and operating the facility (including the access road) at the preferred site would be similar to the general impacts on vegetation discussed in Sections 4.4.1. and 4.4.2. No federally listed threatened or endangered plant species is known to occur in the project area. The only known plant species of concern that might be affected by the proposed facility is the rare Pohl's milkvetch, which is found to the south of the proposed site (i.e., Site A) (see Section 3.4.3.1). Pohl's milkvetch has been threatened by wildland fires and cheatgrass expansions within the greasewood communities in Skull Valley (BLM 1998c). Thus, if wildfires are suppressed near the proposed PFSF, there could be a small positive impact on this species. Accordingly, impacts to the Pohl's milkvetch from construction or operation activities for the project as proposed should be small because it is not located at the proposed PFSF site. Furthermore, PFS has indicated that it will conduct another survey of the site for the Pohl's milkvetch prior to construction to confirm its original findings.

4.4.3.2 Wildlife

Potential impacts to threatened, endangered, and other species of special concern from the construction and operation of the proposed PFSF are due to loss of habitat. Because the site is not within any critical habitat areas and the maximum amount of land to be cleared is a very small portion of Skull Valley (less than 0.1 percent), impacts due to loss of habitat are predicted to be small.

The construction and operation of the facility would decrease the amount of foraging area by up to a maximum of 94 ha (232 acres) for Federally- and State-listed birds. Because this represents less than 0.1 percent of available habitat in Skull Valley, impacts due to loss of habitat are expected to be small. Furthermore, a portion of this area would be temporarily disturbed, while a total of 57 ha (140 acres) would be lost for the life of the project.

The loggerhead shrike is a bird that many times can adapt well to certain types of human development. This species may even realize a positive benefit from the proposed project. Shrikes may benefit if barbed wire fences are constructed, thereby creating more points where their prey could be impaled.

State or Federally listed birds that may use the storage casks as perches, such as ferruginous or Swainson's hawks, would not receive a radiation dose in excess of 1 Sv/yr (100 rem/yr). As set forth above, even if a bird spent 100 percent of its life for a year on the top surface of a cask, the dose received would be well below the 1 Sv/yr (100 rem/yr) criterion.

Mammal habitat would be diminished due to construction of the proposed PFSF. The BLM-listed kit fox may be displaced or forced to change its movement and migration patterns. Skull Valley pocket gophers located on the proposed PFSF site in areas of construction could be displaced or destroyed. No critical areas for deer, antelope, or fox would be affected by the proposed PFSF, however.

As discussed in Section 4.4.2, one potential source of impact to wildlife is the exposure to radiation from the storage casks. The same concerns for wildlife in general would apply to endangered, threatened, and State listed species (e.g., ferruginous hawk, Skull Valley pocket gopher). If State or Federally listed mammals or birds spent excessive amounts of time (more than 76 percent) of a year in close proximity to the bottom vents of the storage casks, radiation doses could exceed the 1 Sv/yr (100 rem/yr) criterion. With the implementation of a comprehensive wildlife monitoring plan, these scenarios would be unlikely. Therefore impacts due to radiation exposure from the cask vents to endangered, threatened, and State listed species are expected to be small.

4.4.4 The Alternative Site (Site B) in Skull Valley

The construction and operation of the proposed PFSF at Site B would include all the same potential impacts as at the proposed site (i.e., Site A). As discussed in Sections 4.4.1 through 4.4.3, most impacts to vegetation and wildlife are predicted to be small and similar to those at Site A. Because Site B is closer to known locations of Pohl's milkvetch, impacts of constructing the facility at that site could be larger than at Site A. The impacts to wildlife would be comparable for Site A and Site B.

Construction of the PFSF at the alternative site (i.e., Site B) in Skull Valley would require the same amount of vegetation clearing and soil grading as construction at the preferred site (i.e., Site A), as discussed in Section 4.4.1. While the alternative site (Site B) has a somewhat greater diversity of micro-communities, the difference is minor, and construction of the proposed facility on Site B would not significantly reduce the biodiversity found in Skull Valley.

There is, however, a greater potential for impacts, including trampling or habitat destruction, to the rare Pohl's milkvetch (see Sections 3.4.3.1 and 4.4.3) if the facility is constructed at Site B instead of Site A, because Site B is approximately 1.6 km (1 mile) closer than Site A to identified populations of that plant species. In particular, widening or otherwise modifying the road to Hickman Knolls could destroy individuals of the species and/or its habitat. With the possible exception of negative impacts to Pohl's milkvetch, the impacts on vegetation of construction and operation at Site B are expected to be identical to those at Site A.

In regard to wildlife, perennial and intermittent streams, and wetlands, the resources on or near Site B are comparable to those at Site A. Thus, the impacts described above for Site A would apply equally to Site B.

4.4.5 Mitigation Measures

4.4.5.1 Vegetation

Use of BMPs listed in Section 9.4.2, during construction of the proposed PFSF should keep the impacts on vegetation to a minimum.

PFS has proposed to plant crested wheatgrass as a fire barrier. When vegetative fuel breaks are used to reduce the size or frequency of wild fires, they should provide protection for soil, water, and other resource values, including the use and perpetuation of native species (BLM 1998a and b). Native species are preferred and should be used where feasible, but the major concern is to maintain ecologically functioning perennial plant communities. Thus, species to be used for revegetation should be selected for ease of establishment, seedling vigor, and persistence in the community. Single species plantings of non-native species on extensive areas should be minimized for ecological and utilitarian reasons. Planting a mixture of native species in the fire barrier, such as the seed mix recommended by BLM for the proposed rail line (see Section 5.4.1.1), would have a beneficial impact on the local ecosystem and biodiversity and should be investigated to determine if it is a feasible alternative to planting a monoculture of crested wheatgrass. [Information on fire, its impact on various plants, and possible additional native species to use for a fire barrier is available on the World Wide Web (USDA Forest Service 1996; VegSpac 1999).] Emphasis should be placed on those plants that are best suited for the proposed PFSF site, with species selection made at the local level by qualified personnel on a site-specific basis.

The revegetation plan should include careful consideration of the appropriate seed mixes and plants to use, soil conditions, and other measures. In addition, the plan should include a thorough study of site-specific conditions (e.g., elevation, slope, aspect, soil chemistry) and the need for irrigation (see Section 2.1.1.2), seed bed preparation, mulching, and fertilizing to aid in successful site restoration (Holzworth and Brown 1999). Other land uses should be restricted on rehabilitated areas for one to two years to enhance habitat recovery. A preinventory of expected needs and a proactive program of encouraging the collection and storage of native seed should be included. BIA and the Skull

Valley Band should be consulted to help identify native species that could meet both goals of providing a fire barrier and increasing biodiversity by improving local ecosystems.

Revegetation with native species would allow the Federal executive agencies to comply with Executive Order (EO) 13112, Invasive Species. This Order requires Federal executive agencies, to the extent practicable and permitted by law, to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, accurately and reliably monitor invasive species populations, provide for restoration of native species and habitat in ecosystems that have been invaded, conduct research on invasive species, and develop technologies to prevent introduction and to provide for environmentally sound control of invasive species. Use of native species instead of crested wheatgrass would promote BIA's compliance with this EO. Therefore, the cooperating agencies recommend that PFS be required to develop a revegetation plan, in consultation with BIA and the Skull Valley Band (see Section 9.4.2). PFS should consider specifying the use of native species in the plan.

Foot and vehicle traffic should be routed away from the known populations of Pohl's milkvetch. Erecting temporary fencing around them during construction to indicate their location would help prevent inadvertent impacts from trampling. A field survey, near the Hickman Knolls Pit (see Section 4.4.3) could be conducted to search for and identify any additional populations of the species before earth disturbing activities begin. Any populations of this plant that are found could be fenced to protect individuals of this species.

Use of herbicides should be restricted to as small an area as necessary. Herbicides must be applied at the proper stage of plant growth for the best control of noxious weeds (Whitson 1998). Care should be taken to ensure that non-target plant species outside the restricted area are not affected. Herbicides must be used in compliance with all applicable laws, including EPA's labeling instructions for prescribed environmental conditions (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). The cooperating agencies recommend that PFS be required to consult with BIA prior to construction in order to develop an adequate plan for controlling noxious weeds during operation of the proposed PFSF (see Section 9.4.2). This consultation should be coordinated with the consultation with BLM regarding the use of herbicides during the operation of the rail line. The plan should include an approved list of herbicides and consideration of non-chemical (e.g., biological) means of controlling noxious weeds (BLM 1991). It should incorporate BLM's most recent standard stipulations for chemical treatment (e.g., spraying) of vegetation (see Appendix 5 in BLM 1983).

4.4.5.2 Wildlife

Before construction begins, the area within 0.8 km (0.5 mile) of the site for the proposed PFSF should be surveyed for burrowing owl and loggerhead shrike nests to ensure that construction activities do not impact nesting birds. If active nests are present, construction activities should be curtailed or restricted during the period from April 1 to August 15 (Stone & Webster 1998; UDWR 1997) to avoid any impacts on nesting success and rearing young. The cooperating agencies recommend that this mitigation measure be required (see Section 9.4.2). Prior to construction, a survey for Skull Valley pocket gopher burrows should also be conducted to minimize potential for loss of individuals during construction. Therefore, the cooperating agencies recommend this mitigation measure be required (see Section 9.4.2). If pocket gopher burrows are located within 30 m (100 ft) of any proposed construction on the Reservation, BIA should be contacted.

The design of the power transmission poles may have an impact on large perching birds such as eagles or hawks. The power poles that would support the power lines for the proposed PFSF could be designed in such a way (i.e., including wooden perches, insulated wires, etc.) that the potential for electrocution would be greatly diminished. Power poles should be designed to conform to the "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996" (APLIC 1996). Given the number of raptors that are known to rest or forage in Skull Valley, the cooperating agencies recommend this mitigation be required (see Section 9.4.2).

PFS proposes to employ facility design features and monitoring and deterrent actions in order to prevent impacts to animals that might gain access to the storage casks. The fence around the 40-ha (99-acre) restricted-access area would be embedded 30 cm (1 ft) into the ground to prevent certain animals from burrowing underneath and gaining access to the storage casks. The fence would be of chain-link design and would be 2.4 m (8 ft) tall to keep larger wildlife from the area. PFS would monitor for signs of any on-site wildlife activity and will take measures to prevent habitation. This monitoring could employ the use of remote video cameras to limit worker exposure to the cask area. PFS has proposed to install devices such as cones or spikes to deter birds from perching and nesting around or on the casks (PFS/RAI2 1999). Small mammals and reptiles would also be kept from vents by wire mesh, and from the area by using traps, if necessary. PFS states that the entire facility would be frequently surveyed by workers. If any signs of wildlife habitation were found, actions would be taken immediately to remove the animals. If State or Federally listed species are likely to be taken, BIA would be contacted. The goal of this mitigation measure should be to preclude animals from being near the casks for an extended period of time. The cooperating agencies recommend PFS be required to develop a monitoring program in consultation with NRC, BIA, and the Skull Valley Band (see Section 9.4.2). The plan should be consistent with the PFS commitments discussed above.

4.5 Socioeconomics and Community Resources

This section describes the potential impacts to socioeconomic and community resources, such as population, land use, employment, economy, housing, community services, utilities, schools, etc. A discussion of traffic, particularly along Skull Valley Road, is also included. The potential for workers moving into the area as a result of the proposed action has been determined and is discussed below.

The existing socioeconomic and community resources in the vicinity of the preferred site (i.e., Site A) for the proposed PFSF are presented in Section 3.5. These resources could be affected either during construction or operation of the proposed PFSF.

Impacts to the socioeconomic and community resources of the Skull Valley Band and their Reservation are indistinguishable from those to the remainder of Tooele County with the exceptions of population, land use, and economic structure. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussions as appropriate.

4.5.1 Construction Impacts at the Preferred Site (Site A)

Both the direct and indirect impacts to socioeconomic and community resources during construction of the proposed PFSF are primarily associated with (1) workers who might move into the area and (2) the transport of construction material to the proposed site. The impacts from workers who might move into the area, and the impacts of transporting construction materials are summarized in Table 4.4, and as discussed in the following paragraphs.

Table 4.4. Potential impacts to socioeconomic and community resources during the construction of the proposed PFSF

Category of potential impact	Significance level of potential impact
Population	Small
Housing	Small
Educational system	Small
Utilities	Small
Solid waste	Small
Transportation and traffic	Moderate to large
Land use	Small
Economic structure	Small but beneficial

The overall approach to the assessment of impacts to socioeconomic and community resources involves the development of an estimate of the number of construction workers who might move into the area. Both the number of direct construction jobs and indirect jobs is considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled in the existing school system. These increased numbers of people in the local area serve as the basis for determining impacts to socioeconomics and community resources during all phases of construction. The analytical approach and method are described below.

The proposed PFSF would be constructed in three phases to optimize the resources and schedule required to expedite facility operation and provide continuous local employment for construction of concrete pads and casks (see Section 2.1.1.2). During Phase I, construction would include all the buildings (Administration Building, Operations and Maintenance Building, Security and Health Physics Building, and Canister Transfer Building), the access road, the ITF near Timpie (if transportation from the railroad is to be by heavy haul tractor/trailer), the new rail line from Skunk Ridge (if PFS's preferred option is selected), and the pads within the southeast quadrant of the restricted-access area. The remainder of the restricted-access area would be constructed in Phases II and III. Phase II would include construction of the pads in the southwest quadrant, and Phase III would include construction of the pads in the northern half of the restricted-access area. Completion of Phase II and III would be scheduled to meet the SNF storage needs of the nuclear power plants.

Phase I construction of the proposed PFSF would begin upon issuance of an NRC license and be completed in two years. Approximately 130 construction workers would be employed on site during Phase I construction period, and 43 construction workers would be employed on site during Phases II and III of the construction period. The construction work force required for constructing the two local transportation options (peak of 125 workers for the rail line option or 35 workers for the ITF) are not included in these totals (see Section 5.4.5). In addition to the jobs that would result directly from facility construction, a number of indirect jobs would be created as a result of the purchases of goods and services by PFS and the construction workers (including purchases by workers at the Pony Express Convenience Store on the Reservation). Based on past experience in similar rural areas (NRC 1996), it can be assumed that each direct job would lead to the creation of 0.5 indirect jobs within the area, for a total of 65 indirect jobs during Phase I and approximately 21 indirect jobs during Phases II and III of the construction period.

Based on worker behavior at similar sites (NRC 1996) and taking into account the relatively small size of the work force and the relative brevity of the construction period, it can be assumed that up to 30 percent of the direct workforce (i.e., approximately 40 workers) could move into the area (i.e., communities in the eastern portions of Tooele County including the Reservation) during Phase I of the construction period. Because many construction workers would probably choose to commute from areas farther away from the proposed PFSF site but within a 60- to 90-minute drive of the site (e.g., Salt Lake City or suburbs of Salt Lake City), it is likely that the actual number of in-moving workers would be substantially less than 40. However, that number is used throughout the following analysis as a reasonable upper bound.

Past experience (NRC 1996) also indicates that approximately 60 percent of inmovers (i.e., 24 workers) would be accompanied by their families, while the remaining 40 percent (16 workers) would come to the area alone. If the inmoving construction workers have an average family size of 2.87, which is the average for Tooele County, (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/rankings/county/hhsizegh.htm) the local population would increase by 85 residents in 40 households due to direct employment. This translates into 16 workers unaccompanied by family, 24 workers accompanied by family, and 45 family members of construction workers.

Indirect jobs generally are less specialized than direct jobs and are more likely to be filled by existing area residents, including residents of Salt Lake City, Provo, and Orem. Accordingly, it can be assumed that only 10 percent of the indirect work force (i.e., seven workers) would move to the area during the construction period. Once again assuming that 60 percent of inmovers (four workers) would bring families and that their average family size would be 2.87, an upper bound of 15 new residents in seven households would be expected as the result of indirect employment.

Combining the above direct and indirect inmigration yields a total of 100 new residents in 47 households as an upper bound. Unaccompanied workers would live in 19 of these households while the other 28 households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/demographics/household.htm), it is expected that 20 additional children would be added to local schools.

4.5.1.1 Population

Impacts to the population levels of Tooele County are expected to be small. Workers who move into the area during the construction period would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed project site and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available. It is possible that members of the Skull Valley Band who return to their Reservation for employment at the proposed PFSF might decide to live on the Reservation. At this time it is impossible to accurately estimate the number of Skull Valley Band members living off the Reservation that would move back. Therefore any estimation of the impact from an increase population on the Reservation would be speculative.

The precise distribution of any inmovers would be determined by a number of factors, including proximity to the site and the availability of housing and public services. The 100 new residents used as an upper bound in this analysis would represent an increase of 0.3 percent to the 1996 population of Tooele County. If all of these inmigrants located in either Grantsville or Tooele, the population increase would be 2.0 percent in Grantsville or 0.7 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

4.5.1.2 Housing

Based the following, any housing impacts are expected to be small. The 47 new households used as an upper bound in this analysis would represent 13.4 percent of the vacant housing units (not counting housing units in Wendover or Dugway) that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced inmovers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities. It should be noted that construction workers would not be permitted to camp on public lands during facility construction, therefore, there would be no impact from construction workers establishing temporary quarters near the proposed PFSF site.

4.5.1.3 Education

The impacts to the education system of Tooele County are expected to be small. The addition of 20 new school-age children would increase enrollment in Tooele County by only 0.25 percent. Even in the highly unlikely event that all inmovers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1 percent. The increase would be 2.7 percent if all new students were enrolled in the Tooele Junior High School, and would be 1.3 percent if all new students were enrolled in the Tooele High School. Similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 2.6 percent in the elementary school, 3.8 percent in the middle school, or 2.5 percent in the high school. It should be noted, however, that the Tooele County School District is already embarked on a significant expansion of its capacity, so that any additional increase may place demands on the system not already anticipated.

4.5.1.4 Utilities

The addition of 47 new households and 100 new residents is expected to result in small impact to utilities. Most if not all of those inmovers would be expected to occupy currently vacant housing units already connected to utilities (e.g., in Rush Valley or Tooele Valley). The impacts of constructing the proposed PFSF itself on water.use within Skull Valley, including impacts to the Skull Valley Band, are expected to be minimal, as discussed in Section 4.2.1. The only off-site utility infrastructure resource connections to be used at the proposed PFSF are for electrical power and telephone service (PFS/RAI1 1999). For each of these services, new connections would be made from existing lines paralleling Skull Valley Road, and new lines would be constructed along the access road to the proposed PFSF. Construction of the proposed PFSF may require that upgraded electrical service (i.e., reliable, higher voltage electricity) be brought to Skull Valley (PFS/ER 2000), which could be considered a positive benefit.

4.5.1.5 Solid and Sanitary Wastes

Only small impacts are expected from managing solid and sanitary wastes during construction of the proposed PFSF. Excavation and construction debris, as well as removed vegetation and backfill would result from construction of the proposed PFSF. Other than construction debris, which would be transported to a licensed landfill for disposal, other solid wastes would remain on the site and be used for other facility purposes (e.g., building the earthen berm). Sanitary wastes would be managed with conventional systems such as underground sewage (septic) and portable toilet systems.

4.5.1.6 Transportation and Traffic

The impacts during Phase I of construction of the proposed PFSF on Skull Valley Road could be moderate to large. However, impacts to other transportation routes (e.g., Interstate 80) should be small. Moreover, the impacts during other construction phases should be less than during Phase I (19 months), when most of the equipment and material and the largest number of construction workers would be using Skull Valley Road.

Construction of the proposed PFSF, including the access road from Skull Valley Road to the site of the proposed PFSF site, the access road flood diversion berm, and initial grading and excavation for the Administration Building and the Operation and Maintenance Building, would require the transport of approximately 92,000 m^3 (120,000 yd^3) of material, requiring an estimated average of approximately 250 truck trips per day (125 trucks going each way) or 23 vehicles per hour to transport the required volumes for construction over the first 40 days of Phase I construction. An additional 24 tanker truck shipments per day of water (48 shipments per day to account for return of empty tankers) would be shipped to the project site to be used for dust suppression and soil compaction. This volume of truck traffic on Skull Valley Road has the potential to result in adverse impacts to traffic movement on Skull Valley Road. As noted in Section 3.5, the most recently available traffic data (1995) indicate an average of 325 vehicles per day from the gate at Dugway Proving Grounds north to Iosepa and 565 vehicles per day from Iosepa north to Interstate 80. In addition to adverse impacts to traffic density, there is the potential for increased wear and maintenance requirements for Skull Valley Road due to heavy truck traffic.

In addition to material, equipment, and water deliveries, a peak construction work force of 130 workers would commute to and from the construction site using individual passenger vehicles and light trucks on a daily basis. These workers could account for an increase of 260 vehicles per day on Skull Valley Road during Phase I of construction. All together, construction of the proposed PFSF (during Phase I) could result in an increase of approximately 560 vehicle trips per day on Skull Valley Road. This increase amounts to approximately 172 percent greater use of Skull Valley Road from the proposed site north to Iosepa and an increase of approximately 100 percent from Iosepa north to Interstate 80. This additional traffic volume would lower the Level of Service (LOS) on Skull Valley Road from Level A to Level B, where Level A is the highest quality of service with little or no restriction on maneuverability or speed caused by other traffic, and level B is a zone of stable flow where operating speed is beginning to be affected by other traffic (PFS/ER 2000). This reduction in LOS also results from delivery trucks moving at a slower rate of speed (estimated at 40 mph) than the posted speed limit of 55 mph, requiring other traffic to reduce travel speed or make additional passing maneuvers.

4.5.1.7 Land Use

The expected impacts for construction are expected to be small. Construction of the proposed PFSF would change the nature of land use within the Reservation. While this change would be qualitatively substantial (i.e., from agricultural to industrial), the land parcel is sufficiently remote and small (when compared to the remainder of the Reservation and surrounding lands) that no quantitatively significant impact would occur.

4.5.1.8 Economic Structure

Because the construction workforce (direct and indirect) would be relatively small compared to current Tooele population/workforce and the construction period would be relatively short (i.e., 9 months), the effect of the proposed PFSF on the economic structure of the local area would be small but favorable. The unemployment rate in Tooele County could fall slightly due to the potential hiring of current residents and the in-moving residence of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by Skull Valley Band members would constitute a positive impact on the Skull Valley Band economy. Moreover, there would be the potential for increased business at the Pony Express Convenience Store on the Reservation.

4.5.2 Impacts During Operations at the Preferred Site

Both the direct and indirect impacts to socioeconomic and community resources during the operational period of the proposed PFSF are primarily associated with workers who might move into the area. These impacts are summarized in Table 4.5, and as discussed in the following paragraphs, would be small.

As described in Section 4.5.1, the overall approach to the assessment of impacts to socioeconomic and community resources involves the development of an estimate of the number of operations workers that might move into the area. Both the number of direct operations jobs and indirect jobs is considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled into the existing school system. These increased numbers of people in the local area serve as the basis for determining impacts to socioeconomic and community resources during the operational period of the facility. The analytical approach and method are described below.

Table 4.5. Potential impacts to socioeconomic and community resources during the operation of the proposed PFSF

Category of potential impact	Significance level of potential impact
Population	Small
Housing	Small
Educational system	Small
Utilities	Small
Solid waste	Small
Transportation and traffic	Small
Land use	Small
Economic structure	Small but beneficial

The proposed PFSF would begin commercial operation following completion of Phase I construction and would provide continuous local employment for the duration of its operation. Approximately 43 full-time positions would be required to staff activities during the operational life of the proposed PFSF. Based on past experience in similar rural areas (NRC 1996), it can be assumed that each direct job would lead to the creation of 0.5 indirect jobs within the area, for a total of 21 indirect jobs during operation of the proposed PFSF.

Based on worker behavior at similar sites (NRC 1996) and taking into account the relatively small size of the work force and the duration of the operation period, it can be assumed that all of the direct workforce (i.e., 43 workers) could move to the area (i.e., communities in the eastern portions of Tooele County) during operations. Because many operations workers would probably choose to commute from areas farther away from the proposed site but within a 60- to 90-minute drive of the site (e.g., Salt Lake City or suburbs of Salt Lake City), it is likely that the actual number of in-moving workers would be substantially less than 43. However, that number is used in the following analysis as a reasonable upper bound. In contrast to the case with construction workers, it is assumed that all inmoving operations workers would bring families since the duration of work is essentially permanent. If the inmoving operations workers have an average family size of 2.87, the average family size for Tooele County, the local population would increase by approximately 120 residents in 42 households due to direct employment. This breaks down into 42 workers accompanied by family, and 78 family members of operations workers.

Indirect jobs generally are less specialized than direct jobs and are more likely to be filled by existing area residents. Accordingly, it can be assumed that only 10 percent of the indirect work force (i.e., two workers) would move to the area during the operations period. Once again assuming that their average family size would be 2.87, an upper bound of six new residents in two households would be expected as a result of indirect employment.

Combining the above direct and indirect inmigration yields a total of 126 new residents in 44 new households as an upper bound. Based on the Tooele County average of 0.7 school aged children per household, it is expected that approximately 30 additional children would be added to local schools.

4.5.2.1 Population

Impacts of facility operations to the population levels of Tooele County are expected to be small. Workers who move into the area during the proposed PFSF's operating period would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed project site and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment at the proposed PFSF might decide to live on the Reservation. At this time it is impossible to accurately estimate the number of Skull Valley Band members living off the Reservation that would move back. Therefore any estimation of the impact from an increase population on the Reservation would be speculative. The precise distribution of inmovers would be determined by a number of factors, including proximity to the site and the availability of housing and public services. The 126 new residents used as an upper bound in this analysis would represent an increase of 0.4 percent to the 1996 population of Tooele County. If all of these inmigrants located in either Grantsville or Tooele, the population increase would be 2.5 percent in Grantsville or 0.9 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

4.5.2.2 Housing

Impacts of facility operations to the housing conditions are expected to be small. The 44 new households used as an upper bound in this analysis would represent 13.0 percent of the vacant housing units (not counting housing units in Wendover or Dugway) that were for sale or rent in Tooele County in 1990. Even if all project-induced inmovers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities.

4.5.2.3 Education

Impacts of the proposed PFSF operations to the education system are expected to be small. The addition of 30 new school-age children would increase enrollment in Tooele County by only 0.37 percent. Even in the highly unlikely event that all inmovers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1.2 percent. The increase would be 4.1 percent if all new students were enrolled in the Tooele Junior High School, and would be 2.1 percent if all new students were enrolled in the Tooele High School. Similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 3.9 percent in the elementary school, 5.7 percent in the middle school, or 3.7 percent in the high school. It should be noted, however, that the Tooele County School District is already embarked on a significant expansion of its capacity, so that any additional increase may place demands on the system not already anticipated.

4.5.2.4 Utilities

The impacts of operating the proposed PFSF upon utilities are expected to be small. The addition of 44 new households and 126 new residents is not expected to strain existing utilities within the area, since most if not all of those inmovers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley). The impacts of operating the proposed PFSF itself on water use within Skull Valley, including impacts to the Skull Valley Band, are expected to be minimal and are addressed quantitatively in Section 4.2. Other utilities (e.g., electric power) would be provided to the proposed site during construction.

4.5.2.5 Solid and Sanitary Wastes

Small quantities of solid wastes would be generated during operation of the proposed PFSF radiation surveys. These wastes would be controlled, stored, and disposed in compliance with 10 CFR Part 20. A sanitary drainage system would be constructed at the proposed PFSF to transmit waste from the building to a septic system. Two septic tank and drain field systems would be constructed at the proposed PFSF to collect and process sanitary waste water from the proposed PFSF. The systems would be sized for the maximum number of personnel expected on site during normal operating periods. No adverse impacts are expected from managing sanitary wastes from the proposed PFSF.

4.5.2.6 Transportation and Traffic

Operation of the proposed PFSF would result in small impacts to the local transportation system due to the movement of operations workers commuting each day to the proposed PFSF and due to the movement of fabricated steel liners for the storage casks and the SNF shipping casks to the proposed PFSF. An operations work force of 43 workers would commute each day using individual private vehicles or light trucks. These workers could account for an increase of 86 vehicle trips per day on Skull Valley Road during operations. Using 1995 traffic volume data as the baseline, this increase amounts to approximately 25 percent greater use of Skull Valley Road from the proposed PFSF north to Iosepa and an increase of 14.9 percent from Iosepa north to Interstate 80. This increase in traffic volume due to commuting operations workers (actually a decrease from the volume generated during construction of the proposed PFSF) would not result in any degradation of the LOS on Skull Valley Road. The weekly over-the-road truck shipment of four steel liners for the storage casks should not result in any discernible adverse impact on traffic. The impacts of operating the proposed PFSF on other transportation routes (e.g., Interstate 80) should be negligible.

4.5.2.7 Land Use

Impacts to land use can be characterized as small because the operation of the proposed PFSF would create no additional impacts to land use beyond those discussed in Section 4.5.1 for the construction of the facility.

4.5.2.8 Economic Structure

Because the operations workforce (direct and indirect) would be relatively small and the operations period would be relatively long, the effect of the proposed project on the economic structure of the local area would be small but favorable and long-lasting. The unemployment rate in Tooele County could fall very slightly due to the potential hiring of current residents and the inmigration of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any operations jobs that might be filled by Tribal members would constitute a positive impact on the Skull Valley Band economy. As during the construction period (see Section 4.5.1), there would also be the potential for increased business at the Pony Express Convenience Store on the Reservation.

Lease payments to the Skull Valley Band could be used for a variety of beneficial purposes, including on-Reservation improvements, to housing, schools, day-care, medical facilities, higher education opportunities, and commercial improvements to the Pony Express Convenience Store (PFS/RAI1 1999).

Additional impacts on the economic structure of the impact area during the operational life of the proposed PFSF include county tax payments, local payroll, and other local expenditures. Tax payments to Tooele County have been estimated to be $92.1 million over the life of the PFSF (based on a proposed agreement negotiated between PFS and the County) (PFS/RAI2 1999). Local payroll during operation of the proposed PFSF has been estimated to be $81 million (based on the PFS's estimate of actual staff positions and anticipated pay for each position, including benefits) (PFS/RAI2 1999). Other local expenditures, including operations support and utilities, have been estimated to be $79 million (based on the PFS's estimate of the number of personnel involved, and utilities based on the number of building and the estimated utility load for these buildings) (PFS/RAI2 1999). In addition, steel liners for the storage casks would be fabricated in the Salt Lake City or Tooele area over about a 21-year period and shipped over-the-road by truck to the site on the Reservation, where they would be filled with concrete from the batch plant; the number of weekly shipments to the site would be four (or 200 per year). The construction of casks and canisters has been estimated to be $747 million (PFS/RAI2 1999). The direct and indirect benefits of cask and liner construction would accrue to whatever jurisdiction hosts their manufacture.

In addition to impacts to the local economic structure, operation of the proposed PFSF would result in tax payments to the State of Utah, estimated to be $53.5 million (based on PFS's review of the Utah tax structure) (PFS/RAI2 1999).

4.5.3 The Alternative Site (Site B) in Skull Valley

The alternative location (i.e., Site B) in Skull Valley for the proposed PFSF is on the Reservation and lies just south of the preferred site (i.e, Site A). Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during either construction or operation of the proposed PFSF if it were to be located at Site B.

4.5.4 Mitigation Measures

The only socioeconomic and community resource that is potentially adversely affected by construction and operation of the proposed PFSF is increased traffic along Skull Valley Road. This potential exists due to the anticipated increase in the use of Skull Valley Road by construction and operation workers, as well as the movement of construction materials to the Reservation. The potential for adverse impacts to traffic on Skull Valley Road is greatest during Phase I construction (i.e., when approximately 300 truck trips per day would be anticipated). The magnitude of such impacts is discussed above. Consideration should be given to the avoidance or amelioration of these impacts by appropriate scheduling of the proposed PFSF related traffic.

4.6 Cultural Resources

The overall cultural resources setting in Skull Valley is discussed in Section 3.6. This section discusses the potential impacts to the known cultural resources in the project areas. As indicated in Section 3.6.1, cultural resources inventories have recently been completed for all proposed action areas in Skull Valley (Newsome 1999). The field effort was preceded by a cultural resources overview and literature search, Class I, (Bright and Schroedl 1998). The Skull Valley Band has not expressed any concerns about TCPs being affected. Thus, the potential for adverse impacts to cultural resources and the requirement for mitigative activities can be accurately addressed.

4.6.1 Construction Impacts at the Preferred Site (Site A)

Based on the results of the intensive field cultural resources survey of the proposed PFSF site, as set forth below, potential impacts to archaeological and historical resources from construction of the proposed PFSF are considered to be small.

The general environmental setting at this site is such that the potential for locating archaeological or historic properties is low. Site A is located in the center of the valley, exhibits no relief (i.e., no noticeable change in elevation across the proposed site), and is characterized by a vegetative community approximately 70 percent grasses and 30 percent bare ground. No perennial surface water resources are located near the proposed site.

A cultural resource inventory of about 400 ha (1,000 acres) for the proposed PFSF area on the Reservation did not encounter any cultural resources properties. However, four isolated artifacts were noted, one in the southeast corner of the proposed PFSF area and three others within the corridor for the east-west access road that would extend from the existing Skull Valley Road to the proposed PFSF (Newsome 1999). Two of these isolated occurrences were nondiagnostic stone flakes and two were identifiable early prehistoric projectile points. Because these finds are isolated artifacts and not designated as cultural resources properties, none of these items is considered potentially eligible for listing on the NRHP. Because these isolated artifacts were all found in areas of soil deflation, there could be some potential for additional artifacts that are currently buried to be exposed during construction.

However, should buried cultural resources be encountered during the construction phase, it will be necessary to implement specific mitigation measures as described in Section 4.6.5.

4.6.2 Impacts During Operations at the Preferred Site

Normal operation of the proposed PFSF following construction of the transportation route and the PFSF would not be expected to have potential for impacts on archaeological and historical resources since no additional ground disturbance will occur. Similarly, decommissioning activities for the proposed PFSF will take place in previously disturbed areas. Therefore, the overall impact on cultural resources from operation of the proposed PFSF is expected to be small.

4.6.3 Native American Cultural Resources

General issues related to broader cultural values held by some Skull Valley Band members living on the Reservation in proximity to the proposed PFSF have been raised in public scoping meetings. The proposed action would, in their view, lead to potential impacts on traditional cultural values, such as (1) natural resources (e.g., plants and animals), (2) reverence for the larger area as a cultural landscape, and (3) sacred religious ceremonies.

However, according to the Skull Valley Band Tribal Chairman, no traditional cultural properties or use of culturally important natural resources are known within the specific project areas (PFS/ER 2000). Traditional plants of value to the Skull Valley Band (e.g., sage and cedar) are sparse in the PFS project area due to a lack of surface water, and are considered inferior to the same plants growing in the nearby mountains east of the Reservation and the adjacent Tooele Valley. Natural resources extant at proposed project areas on the Reservation are similar to those found throughout much of rest the valley (see Section 4.4). No further information was provided during the scoping meeting.

Consequently, construction and operation of the storage facility on the Reservation is considered to have a small potential for affecting Tribal cultural values or traditional cultural properties. Based on the known situation, no mitigation measures are required for potential impacts to Native American resources.

4.6.4 The Alternative Site (Site B) in Skull Valley

The alternative site in Skull Valley (i.e., Site B) is located just south of the preferred site (i.e., Site A), and generally in the same type of environmental setting. The acreage that includes Site B was included in the cultural resources inventory for the proposed PFSF, and findings for the preferred site are applicable at the alternative site. The potential for adverse impacts to cultural resources from construction and operation of the storage facility at the alternative site on the Reservation is expected to be small.

4.6.5 Mitigation Measures

In general, land clearing, excavation, and construction activities have the potential to disturb or cause the relocation of cultural data and artifacts. The operation of industrial facilities can degrade the value of traditional sites or uses. In addition, human activity in project areas causes concern that members of the workforce could affect cultural resource sites, especially those at buried locations or with artifacts.

Actions taken to mitigate adverse impacts to cultural resources at the proposed PFSF include those required by law or regulation, as well as those determined by the cooperating Federal agencies and the Skull Valley Band to be included in the project to reduce or eliminate such impacts. The surface of all project areas where construction activities will occur has been intensively inspected to identify archaeological, historic or other cultural resources that may exist in those areas. The survey did not identify any cultural resources on the proposed PFSF site.

Buried resources could be encountered during construction. To address these cases, mitigation measures that comply with historic preservation laws and regulations should be put in place to ensure that PFS would implement appropriate measures following identification and evaluation of significant cultural resources. Therefore, the cooperating agencies recommend PFS be required to have a process to identify and evaluate any buried artifacts or cultural resources during construction (see Section 9.4.2).

4.7 Human Health Impacts

Except for transportation-related impacts, all human health impacts resulting from construction, operation and potential accidents at the proposed PFSF are discussed in this section. The human health impacts associated with the construction and operation of local transportation facilities in Skull Valley and the transportation of SNF are discussed in Section 5.7.

Section 4.7.1 presents the analysis of non-radiological impacts from construction and operation of the proposed PFSF. The analysis in Section 4.7.1 includes industrial morbidity and mortality from occupation-related activities and accidents. Section 4.7.2 presents the analysis of radiological impacts from the SNF stored at the facility, as well as the potential radiological accidents and their consequences.

4.7.1 Non-Radiological Impacts at the Proposed Site (Site A)

Potential health impacts to workers during construction of the proposed PFSF would be limited to the normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). These normal hazards include fatal and nonfatal occupational injuries, which, for the construction industry, typically result from overexertion, falls, or being struck by equipment (NSC 1994). Because there are no unusual situations anticipated to make the construction-related activities at the proposed PFSF more hazardous than normal, there would be only small impacts to worker health and safety due to fatal and nonfatal occupational construction-related activities. The staff finds the non-radiological occupational health effects of the proposed action to be small.

During the construction and operation of the proposed PFSF, there are several non-radiological pollutants that may be of concern to worker and public health. The first group of pollutants of concern include the criteria pollutants and dust (both of which are addressed in Section 4.3). With adequate control measures, such as treating areas with water or chemical surfactants for dust suppression, etc., the impact on worker and public health would be expected to be small. There are no additional potential health impacts to the public from the proposed project, since members of the general public would not be allowed on the proposed PFSF site. Therefore, only fatal and nonfatal construction and occupational injuries warrant any further analysis. These types of injuries are discussed below.

In order to estimate the number of potential fatal and nonfatal occupational injuries due to the initial construction, normal operations, and decommissioning of the proposed PFSF, data on fatal occupational injuries per 100,000 workers per year and data on nonfatal occupational injuries per 100 full-time workers per year over the time period of 1994–1998 were collected from the Bureau of

Labor Statistics (BLS) Web site (http://stats.bls.gov/oshhcfoil.htm) and the Occupational Safety and Health Administration (OSHA) Web site (http://www.osha.gov/oshstats/work. html). No obvious time trend in the data for this period was noted. The arithmetic mean and standard deviation for the fatal and nonfatal occupational injury rates were calculated. The BLS and OSHA construction, trucking, and warehousing industry injury rates were used to estimate the potential fatal and nonfatal occupational injuries. Table 4.6 presents the expected number of potentially fatal and nonfatal occupational injuries during the construction and normal operations of the proposed PFSF.

Table 4.6. Estimated probabilities of fatal and nonfatal occupational injuries for the construction and operation of the proposed PFSF

Activity	Duration of activity	Probability of fatal injuries	Probability of nonfatal injuries
Construction			
Phase 1	2 years	0.07	0.51
Phase 2	10 years	0.062	0.43
Phase 3	10 years	0.062	0.43
Operations	40 years[a]	0.37	1.0[b]

[a]40 years includes 20 years of operations to load the storage area and 20 years of operations to empty the storage area.

[b]Labor statistics indicate that 1.9 non-fatal injuries would be expected over the 40-year period.

Source: Bureau of Labor Statistics (BLS) Internet Web site (http://stats.bls.gov/oshhcfoil.htm) and the Occupational Safety and Health Administration (OSHA) Internet Web site (http://www.osha.gov/oshstats/work.html).

There would be only small impacts to worker health and safety due to potentially fatal and nonfatal occupational injuries resulting from construction and normal operational activities. The estimated probabilities of injuries and fatalities would not require or warrant Federal, State, or community attention, thereby driving a stop or change in construction-related, normal operational-related procedures. Therefore, the staff finds the impacts would be small.

4.7.1.1 Potential Worker Injuries During Construction

The proposed PFSF facility would be subject to OSHA'S General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). Construction risks would be minimized by adherence to the procedures and policies required by OSHA and the State of Utah. These standards establish practices, procedures, exposure limits, and equipment specifications to preserve employee health and safety. In addition, OSHA inspections would also be employed in an effort to reduce the frequency of accidents and further ensure worker safety.

Potential fatalities. The construction of the proposed PFSF would occur in three phases. Phase 1 construction would require a peak work force of 130 workers and would be completed in 2 years. Based on a statistical analysis of construction worker fatal occupational injuries (i.e., fatalities), there is about a 7 percent chance that a fatality would occur over the two year period. This estimate is conservative, because it assumes there would be a work force of 130 continually for the full 2 years.

Phase 2 and 3 construction would require a work force of 43 workers. Each phase would be completed in 10 years. It was estimated that less than 1 fatality would occur during each Phase (i.e., less than 1 fatality in Phase 2 and less than 1 fatality in Phase 3).

Potential nonfatal occupation injuries. Based on a statistical analysis of construction worker nonfatal occupational injuries, the probability of a nonfatal injury occurring during the 2 years of Phase 1 construction is estimated to be about 0.51. Phase 2 and 3 construction would each last 10 years. For each phase of construction, the probability of a nonfatal injury is estimated to be 0.43.

4.7.1.2 Potential Worker Injuries During Operations

Following Phase 1 construction of the proposed PFSF, the total number of employees needed to operate the facility would be approximately 43 workers. The overall design, layout, and operation of the proposed PFSF would minimize hazards to human health. Compliance with the Federal Occupational Safety and Health Standards, as well as safety standards specified by NRC, would help maintain the occupational safety record.

Potential fatalities. Operation of the proposed PFSF would involve receiving, transferring, storing, and shipping the SNF and would require a work force of about 43 people for approximately 40 years. Based on a statistical analysis of the trucking and warehousing industry, it was estimated that there is about a 37 percent chance that a fatality would occur during the 40 year period of operations.

Potential nonfatal occupational injuries. An analysis of the trucking and warehousing industry statistics indicated that the expected number of nonfatal injuries at the proposed PFSF during normal operations over 40 years would be 1.9.

4.7.2 Radiological Impacts at the Proposed Site (Site A)

Construction and operation of the proposed PFSF would result in exposing PFSF workers and the general public to ionizing radiation. Phase 1 construction would be conducted without the presence of radioactive materials. As construction moves into Phases 2 and 3, there would be some storage casks present, and on-going construction activities would result in the installation of more storage casks. Thus, construction work leading to additional storage pads would be performed at the same time some pads are occupied with storage casks. Moreover, normal operations would bring workers into areas where they would receive radiation exposures. These would include the personnel that inspect and service the casks, the security personnel, and the machine operators who move casks to their storage locations. Radiological health impacts from the proposed action and alternatives are determined to be small, as explained below.

The proposed PFSF is an interim facility; thus, after a period of SNF receipt and storage, the SNF would be shipped to a permanent repository. During shipment to the permanent repository, the activities would be similar to those which occurred during the receipt of the SNF at the proposed PFSF, and the health impacts of both sets of activities would be similar. Therefore, no specific additional analyses have been performed for health impacts for this phase. The radiological impact for removal of SNF is taken to be the same as the impact of receipt of SNF at the proposed PFSF.

Radiation dose measures are discussed in the dialogue box presented in Section 3.7. The same measures are used in this section: radiation dose is given in terms of milliSiverts (millirem) and the consequential risk in terms of latent cancer fatality (LCF). The coefficients or factors used for health effects in this DEIS for the public and occupational radiation risk are 5×10^{-4} and 4×10^{-4} health effects/rem, respectively. These coefficients are based on data obtained at much higher doses and dose rates than those encountered by the general public or workers. A linear extrapolation from the lowest doses at which effects are observable down to the occupational range was used to generate these coefficients. The assumption of a linear extrapolation has considerable uncertainty, but is believed to present a conservative estimate of the risk. Table 3.18 in Section 3.7 provides the equivalent annual dose received by an average individual in the United States. Measurements have been made in Skull Valley that reflect the cosmic ray and terrestrial portions of Table 3.18 (PFS/ER 2000 and PFS/RAI2 1999e). These data indicated that the two measures were roughly 1.5 times the national average. However, because of the sparse nature of on-site data, all comparisons below are made to the national average. The doses given below are presented in the form of incremental additions to existing background radiation doses. That is, in the discussion below, the estimated doses attributable to the PFSF are not added to background doses.

The methods used to estimate radiological impacts are as follows: A staff analysis was made of PFS's approach. Results of dose estimates for key conditions demonstrated that PFS's approach provided results consistent with those of the staff; thus the analysis presented in this section is based on PFS's SAR. PFS has provided dose estimates for the Holtec HI-STORM cask.

4.7.2.1 Estimated Dose to the General Public

To assess the radiological impacts to the general public from routine operation of the proposed PFSF, analyses were performed that examine the potential dose to a hypothetical maximally exposed individual (MEI) located at the boundary of the proposed PFSF, as well as to individuals who may actually be present or reside nearby. In evaluating the potential radiation doses to members of the public, it is important to examine (1) the potential pathways of exposure and (2) the potential sources of radiation. Considering each of these two matters assumes that all important issues are addressed.

The potential exposure pathways at the Skull Valley site include: (1) direct exposure to radiation (neutrons and gamma rays), including skyshine, from the storage casks, (2) exposure to radioactive substances through ingestion of contaminated water or food, including plants and animals in the vicinity of the site that may be used for subsistence, and (3) exposure through inhalation of airborne radionuclide contamination. The evaluation of exposures from the first route requires consideration of the radiation source (i.e., the casks). Exposures from the second and third routes require that some radioactive material escape from the casks and the proposed PFSF. Given the PFS start clean/stay clean philosophy (i.e., that PFS plans to reject and return canisters that have external contamination), as well as the fact that no canisters would be opened at the proposed PFSF, and considering the engineered features of the canister/cask, there appears to be no viable mechanism by which radioactive materials would migrate off-site, or even away from the casks. Thus, while the latter two exposure routes are possible, there is no radioactive material to move via those pathways during normal conditions, and hence, there is no opportunity for impacts from these pathways.

For this analysis, under normal conditions, the casks are assumed to maintain confinement of radioactive material. The lid of the HI-STORM cask is double sealed, and consists of a closure lid to shell weld (lid-to-shell) and a closure ring to shell weld (ring-to-shell). In order for a leak to the environment to occur, both the primary and secondary welds must be leaking. Because the confinement boundary is welded and the temperature and pressure of the canister are within the design limits, no discernible leakage is credible (NRC 2000). In view of the above, direct radiation, including skyshine, from the casks would be the only source of radiation to members of the public as a result of normal operations. Both gamma rays and neutrons would emanate from the array of stored casks, as a result of previous irradiation and isotopes undergoing radioactive decay. Estimates of radiation levels for the HI-STORM casks proposed by PFS are presented in Chapter 2, Table 2.6 for both surface contact and at a distance of 1 m (39 inches).

Doses at the nearest boundary. Dose rates for locations on the boundary of the OCA (see Figure 2.1) were presented by PFS for the HI-STORM cask design. The location that would result in the maximum exposure for a person at the boundary of the facility is to the north at a distance of 600 m (2,000 ft) from the boundary of the RA, which is 646 m (2,120 ft) from the storage pads. For the purposes of analysis, it was assumed that the PFSF consisted of an array of 4,000 HI-STORM storage casks each containing 40,000 MWD/MTU burnup and 10-year cooled PWR SNF. PFS has indicated that the average or typical SNF expected to be stored at PFSF would be PWR fuel having a 35,000 MWD/MTU burnup and 20 years cooling time. Such SNF would result in lower doses than the SNF assumed in the staff analysis. PWR fuel was assumed because PFS determined that the contact dose rates on top and at the duct openings of a HI-STORM storage cask containing PWR fuel are higher than those of HI-STORM casks containing BWR SNF (PFS/SAR 2000). For a 4,000-cask array, the total dose rate at the OCA boundary location for the MEI would be 0.0000283 mSv/hr (0.00283 mrem/hr).

Assuming an individual works at the fence boundary at some time in the future, as much as 2000 hours a year could be spent at this location. For an assumed annual 2,000 hours of exposure to a hypothetical individual at this location, the maximum annual dose to this individual would be 0.056 mSv (5.6 mrem). Doses to real individuals farther from the OCA, or who spend less than 2,000 hours at the boundary, would be smaller. The estimated 0.056 mSv (5.6 mrem) dose is less than the 0.25 mSv (25 mrem) regulatory limit specified in 10 CFR 72.104 for maximum permissible annual whole body dose to any real individual. The 0.056 mSv/yr (5.6 mrem/yr) dose corresponds to slightly less than 2 percent of the natural background radiation dose in the United States of 3.0 mSv/yr (300 mrem/yr) (see Table 3.18). Using ICRP (1991) risk factors relating dose and LCF risk for members of the public [i.e., 5×10^{-5} LCF/mSv (5×10^{-7} LCF/mrem)], the 0.056 mSv/yr (5.6 mrem/yr) dose corresponds to an annual LCF risk of about 3×10^{-6} or about three chances in one million of developing a fatal cancer from one year of operations.

Dose to the nearest resident. The nearest resident is approximately 3.2 km (2 miles) east-southeast of the proposed PFSF site. At large distances, absorption and attenuation of radiation in the air becomes an important factor. Calculations from the HI-STORM cask vendor (see PFS/SAR 2000) indicate the maximum dose to the nearest resident would be 0.00034 mSv/yr (0.034 mrem/yr), assuming a resident spent 8,760 hours (an entire year) at the location without shielding by the residence or other structures such as the flood protection berms. The computed 0.00034 mSv/yr (0.034 mrem) dose is smaller than the 0.25 mSv (25 mrem) regulatory limit specified in 10 CFR 72.104 for maximum permissible annual whole body dose to any real individual. The 0.00034 mSv/yr (0.034 mrem/yr) dose corresponds to about 0.01 percent of the natural background radiation dose in the United States. In addition, the 0.00034 mSv (0.034 mrem) dose also corresponds to an LCF risk of about 2×10^{-8} or two chances in 100 million of developing a fatal cancer from the maximum radiation exposure to an individual located at the nearest residence resulting from one year of operations.

4.7.2.2 Estimated Dose to Occupational Personnel

Workers at PFSF would perform occupational tasks that can be grouped into four categories: (1) handling (i.e., receiving, transferring, and moving) of the SNF; (2) security, inspection, and maintenance activities; (3) administrative and management; and (4) facility construction.

Category 1. PFS estimates that approximately 12 workers would be involved in Category 1 tasks: four for maintenance/operation activities, four for electrical activities, and four for radiation protection/health physics. Estimates of radiation dose to these workers have been made using time/motion studies. These studies are a part of PFS's ALARA (i.e., as low as reasonably achievable) dose reduction program. Occupational radiation exposures were estimated for the HI-STORM cask during the receipt of the shipping cask, transfer of the canister from the shipping cask to the storage cask (using a transfer cask), movement of the storage cask to the pad, and emplacement of the cask on the pad. The estimated dose rate values included both neutron and gamma contributions for fuel compositions considered to be representative of typical fuels. Details of the dose-task relationships can be found in Tables 7.4-1 and 7.4-2 of PFS's SAR (PFS/SAR 2000).

Per individual canister, a collective dose of about 0.0025 person-Sv (0.25 person-rem) is estimated. The person-Sv (person-rem) is an expression of the collective dose equivalent exposure to a number of individuals doing different tasks. Based on receipt of 200 casks annually, the total collective annual dose equivalent for Category 1 tasks is estimated to be approximately 0.49 person-Sv/yr (49 person-rem/yr). This yields an average of 0.0408 Sv/yr (4.08 rem/yr) for each of the 12 individuals. This dose is below the 0.05 Sv/yr (5 rem/yr) total effective dose regulatory limit specified in 10 CFR 20.1201(a) for occupational exposure. This dose equates to an LCF risk of 0.0016 or about one chance in 613 of developing a fatal cancer from one year of operations. Because these exposures do not exceed NRC regulatory levels, the staff finds the impacts to be small. In addition, the applicant's ALARA program would likely reduce the doses described above (see Section 4.7.4).

Category 2. PFS indicates that approximately 15 people would be involved in inspections and maintenance tasks. These tasks would take place inside the restricted-access area fence and would include quarterly inspection, cleaning of debris from inlet ducts, and monitoring temperatures of the casks. These duties would be performed by the same workers that perform Category 1 tasks. These Category 2 tasks would result in a total collective dose equivalent of 0.037 person-Sv (3.7 person-rem) annually or approximately 0.0025 Sv/yr (0.25 rem/yr) for each of the 15 people. A collective dose of 0.037 person-Sv (3.7 person-rem) equates to an LCF risk of 0.0015 or one chance in 675 of developing a fatal cancer from one year of operations.

The 12 workers involved in Category 1 and Category 2 tasks would share 0.515 person-Sv (i.e., 0.49 + 0.025 person-Sv) [51.5 person-rem (i.e., 49 + 2.5 person-rem)] annually. The average annual dose for each worker in these categories would be 0.0425 Sv (4.25 rem), which corresponds to an LCF of 0.0017 (one chance in 588). The summed doses are within NRC regulatory level for occupational exposure; hence, the impacts are small.

The final Category 2 task involves security. Based on 4,000 storage casks, the radiation dose rate at the closest point outside of the restricted-access area (where security personnel will provide inspections) is in the range of 0.01 mSv/hr (1 mrem/hr). With multiple inspections each day, the security force is expected to accumulate approximately 0.006 person-Sv (0.6 person-rem) annually.

The total dose resulting from all Category 2 tasks would be 0.043 person-Sv (4.3 person-rem) annually (PFS/SAR 2000). Because these exposures do not exceed regulatory levels, the impacts are small.

Category 3. The next category involves tasks that are primarily associated with administrative functions. These workers would be located in buildings generally 600 m (2,000 ft) or more away from the restricted-access area and the buildings in which they work would provide shielding for them. Individual dose rates are anticipated to be below 0.25 mSv/yr (25 mrem/yr), not taking into account building shielding (PFS/SAR 2000). This upper limit dose to administrative personnel is about 8 percent of the natural background radiation dose in the United States (see Table 3.18).

Category 4. During Phase 1 construction, the construction workers will have no exposure from storage casks because there will be none delivered until after Phase 1 is completed. However, during Phases 2 and 3 of construction, there will be storage casks on some of the pads while the construction workers prepare the additional storage pads. PFS discloses (PFS/RAI2 1999i) the estimated dose to an individual worker during Phase 2 as 0.17 mSv/yr (17 mrem/yr), which corresponds to an LCF of 6.8×10^{-6} or about one chance in 147,050. For a work crew of 43 people, the collective dose would be about 0.0073 person-Sv/yr (0.73 person-rem/yr). The exposure during Phase 2 construction is well within NRC dose limits and is small.

During the first half of Phase 3 construction, the workers would be relatively far from stored casks. The estimated dose to an individual worker during the first half of Phase 3 is 0.33 mSv/yr (33 mrem/yr), which corresponds to an LCF of 1.3×10^{-5} or about one chance in 75,750. For a work crew of 43 people, the collective dose would be about 0.014 person-Sv (1.4 person-rem). The exposure during the first half of Phase 3 construction is well within NRC dose limits and is small.

During the second half of Phase 3 construction, the workers would be relatively near stored casks. The estimated dose to an individual worker during the second half of Phase 3 is 0.0021 Sv/yr (0.21 rem/yr), which corresponds to an LCF of 0.000084 or about one chance in 11,905. For a work crew of 43 people, the collective dose would be about 0.09 person-Sv (9.0 person-rem). The exposure during the second half of Phase 3 construction is well within NRC dose limits and is small.

4.7.2.3 Estimated Doses from Off-Normal Operations and Accidents

Off-normal operations and accidents could potentially result in members of the general public being exposed to additional levels of radiation or radiological effluents, beyond those associated with routine operations. The potential radiological impacts of off-normal operations and accidents are presented and discussed in this section. Radiological impacts from possible off-normal operations and accidents at the proposed PFSF are considered to be small. The analyses presented in this DEIS are not intended to substitute for a detailed safety analysis or accident/risk assessment. A more detailed examination will be included in the NRC staff's final SER, which is to be completed as part of the proposed PFSF licensing process. The information evaluated in this section is based on data provided by PFS. The analyses summarized in this DEIS are only intended to identify and bound the types of environmental impacts that could accompany off-normal operations or hypothetical accidents.

Four categories of design events have been identified by PFS to aid in the examination of requirements for satisfying operational and safety criteria. The four categories are:

- Design Event I; an event associated with normal operations.
- Design Event II; an event associated with off-normal operations that can be expected to occur with moderate frequency, or on the order of once during a calendar year of operation of the proposed PFSF operations.
- Design Event III; an infrequent event that could be reasonably expected to occur over the lifetime of the proposed PFSF.
- Design Event IV; an event that is postulated to occur because it establishes a conservative design basis for systems, structures, and components important to safety.

Doses from the Design Event I scenarios are included for worker categories 1 through 4, above. Hence, the analyses presented in this section focus on the last three design event categories because of the potential magnitude of the consequences of such events.

Design Event II. A Design Event II includes scenarios that result in a loss of external electrical power, off-normal ambient temperatures, partial blockage of storage cask air inlet ducts, operator error, and off-normal contamination release. Of these events, only partial blockage of the storage cask inlet ducts and release of surface contamination were found to result in either worker exposures or release of radioactive materials. These two events are discussed below.

In the event of a partial blockage of the inlet ducts of a storage cask, facility personnel would be required to remove the debris or other foreign material blocking the duct(s). It is assumed that a single worker kneeling with hands on the inlet duct would require 30 minutes to clear the ducts. Assuming the highest dose rates associated with a storage cask containing SNF, a worker could accrue approximately 0.193 mSv (19.3 mrem) to the hands and forearms and 0.293 mSv (29.3 mrem) to the chest and body from the subject storage cask and the adjacent casks.

The other Design Event II involves the postulated release of surface contamination from the exterior of a fuel-containing canister into the environment. The analysis conservatively assumes that removable contamination at a level of 1×10^{-4} µCi/cm^2 covers the entire external surface of a canister and the entire amount of external surface contamination is assumed to be released to the atmosphere in the single Design Event II; however, this level is much higher than is anticipated for canisters that would be received at the proposed PFSF. This is because surveys would be performed at the originating nuclear power plant to assess any removable contamination on the exterior of the canisters, and similar surveys would be conducted upon the receipt of the canisters at the proposed PFSF. These surveys would ensure that the aforementioned levels of exterior contamination are not encountered at the proposed PFSF.

For this event, PFS's ER examines a hypothetical individual located 500 m (1,640 ft) downwind from the release point. In addition, the most unfavorable meteorological conditions are assumed, and the dominant radioactive isotope released is assumed to be Cobalt-60 (Co-60). Co-60 is assumed because any contamination on the exterior surface of the canister is likely to come from the radioactive particulates suspended in the spent fuel pool water. At the time of loading, most of the particulates in the pool are the long half-life corrosion products from SNF surfaces that might dislodge during SNF movement. The most prominent particulates are Co-60, Co-58, Iron-55, Iron-59, Manganese-54, Chromium-51, and Zinc-65. Of these products Co-60 has the highest inhalation dose conversion factor and half life (5.27 years) (PFS/SAR 2000). For these conditions, the individual exposed at 500 m (1,640 ft) would receive a total effective dose equivalent of 0.000044 mSv (0.0044 mrem) and a committed dose equivalent to the lungs (the maximally exposed body organ) of 0.000255 mSv (0.0255 mrem). For on-site personnel, located 150 m from the release point, the total effective dose equivalent would be 0.0003 mSv (0.03 mrem), and the committed dose equivalent to the lungs would be 0.002 mSv (0.2 mrem). All of the aforementioned doses are well below the regulatory dose limits for off-normal events given in 10 CFR 72.104. During an off-normal event, the annual dose equivalent to any individual located beyond the controlled area must not exceed 0.25 mSv (25 mrem) to the whole body, 0.75 mSv (75 mrem) to the thyroid, and 0.25 mSv (25 mrem) to any other organ.

Design Events III and IV. For the purposes of analysis, no distinction is made between Design Events III and IV. Design Event III and IV include events such as earthquakes; tornadoes and missiles generated by natural phenomena; floods; fire and explosions; storage cask drop or tip-over; loss of shielding; adiabatic heatup resulting from 100 percent blockage of air inlet ducts; and lightning. Based on its evaluation to date, the staff has concluded that two events (i.e., extreme winds and 100 percent air duct blockage) might create situations in which worker personnel could be exposed to higher levels of radiation than normal. None of the credible accident scenarios reviewed to date resulted in off-site radiological consequences. However, for the purposes of demonstrating compliance with 10 CFR 72.106(b), a hypothetical accident that results in an off-site release was analyzed. These events are discussed in the following paragraphs. A discussion of other accident events can be found in PFS's SAR.

Extreme winds in combination with debris (or missiles) from a design basis tornado [i.e., maximum wind speeds of 380 km/hr (240 mph); see PFS/SAR 2000] are not capable of overturning a storage cask or of damaging a canister within a storage cask, therefore, no radioactivity would be released. The outer-shell of the HI-STORM cask is constructed of 1.9-cm (0.75-inch) thick steel, and repair would not restore the cask to its original condition. Therefore, the dual-purpose canister would need to be removed from the storage cask and placed in a new cask. The dose for this activity would be about 2.47 person-Sv (247 person-mrem).

On-site workers might also receive a dose during the removal of debris or other foreign material that created a 100 percent blockage of the inlet air ducts on a storage cask. A partial blockage was discussed above under Design Event II. The radiation dose to the worker who removes the 100 percent blockage is estimated to be double the dose estimated for the partial blockage case; hence, for the 100 percent blockage case, the dose to the worker would be 0.586 mSv (58.6 mrem) to the hands and forearms and 0.386 mSv (38.6 mrem) to the chest, which is well below acceptable limits.

Canister leakage under hypothetical accident conditions is not considered to be a credible event. Nevertheless, to demonstrate compliance with 10 CFR 72.106(b), a bounding calculation was performed. For this calculation, a leak rate of 1×10^{-4} cm^3/s is postulated and is assumed to remain undetected for 30 days, as well as 100 percent fuel rod failure. The leak rate assumed exceeds the vendor's calculated leak rate of 1.25×10^{-5} cm^3/s (at 843°K, 9.5 atm) for the HI-STORM storage cask. A suite of over 20 radionuclides is assumed to escape in the leak. The primary exposure mechanism would be inhalation of the leaking material. The resulting total effective dose equivalent to the exposed individual at the OCA boundary [approximately 500 m (1,640 ft) from the Canister Transfer Building] downwind from the leak would be about 0.76 mSv (76 mrem). The maximum organ dose, 8.24 mSv (824 mrem), is the committed dose equivalent to the bone surface plus the dose for submersion in the plume. This dose is well below the regulatory dose limit for accidents in

10 CFR 72.106 [i.e., 50 mSv (5,000 mrem) for accidents]. Therefore, any individuals located on or beyond the nearest OCA boundary would not receive a dose that exceeds the regulatory limit.

For an evaluation of the potential doses from environmental pathways following deposition of material in the plume from the same hypothetical loss-of-confinement accident described in the preceding paragraph, the RESRAD computer code was used. The RESRAD analysis involves the hypothetical deposition of radionuclides from the atmospheric plume and the subsequent direct exposure to contaminated ground, inhalation of resuspended radioactive particles, ingestion of milk and beef following grazing in contaminated areas, and inadvertent ingestion of soil. The assumed exposure scenarios are considered to be conservative, given the current land use and conditions adjacent to the boundary of the proposed PFSF [i.e., at the 500 m (1,640 ft) downwind location]. The dominant exposure pathway was found to be contaminated land, with the radionuclide Co-60 being the largest contributor to dose. The resulting exposures from the assumed deposition of all radionuclides via all environmental pathways were total effective dose equivalents of 0.027 mSv/yr (2.7 mrem/yr) at 500 m (1,640 ft). This value is well below the dose limits established for accidents in 10 CFR 72.106; hence, the potential impacts would be small.

It is concluded, prior to the completion of the NRC's SER, that there appear to be no credible mechanisms (either from off-normal operations or from hypothetical accidents) that would result in the release of radioactive material into the environment. The only credible exposure scenarios are associated with worker exposures during cleaning of the storage cask vents or replacing a cask damaged by windborne debris. Such exposures would be small and would be administratively controlled to further reduce the levels; hence, the potential impacts would be small.

4.7.3 Impacts at the Alternative Site (Site B) in Skull Valley

The radiological impacts of constructing and operating the proposed PFSF at Site B would not be appreciably different than those described in Section 4.7.2 for Site A. While Site B is approximately 0.8 km (0.5 mile) closer to the nearest resident and would result in a slightly higher radiological dose to that resident, the difference is negligible.

4.7.4 Mitigation Measures

No additional mitigation measures would appreciably reduce the small radiological impact to the general public from routine operation of the proposed PFSF. Operations involving transfer of the canister and subsequent movement of the storage cask to its storage pad destination will require additional ALARA planning if PFS desires to employ the small labor force suggested in its ER. The staff's assessment is that the 0.515 person-Sv (51.5 person-rem) for 12 workers—as estimated by PFS to result from the canister transfer/transport operations and maintenance—would require efforts to keep each worker's dose below the 0.05 Sv/yr (5 rem/yr) limit in 10 CFR 20.1201(a) for occupational exposure. In actual practice, individual doses to occupational personnel would be administratively controlled to ensure that they are maintained below the 0.05 Sv/yr (5 rem/yr) total effective dose equivalent occupational limit. The occupational dose limit for workers of 5 rem/yr is based on consideration of the potential for delayed biological effects. The regulatory limit, together with application of the concept of keeping occupational doses ALARA, provides a level of risk of delayed effects considered acceptable by the NRC. Occupational doses to workers at the proposed PFSF could be maintained ALARA by means of active programs that involve administrative controls, engineering controls, measurements, and training. The proposed PFSF Radiation Protection

Manager reports directly to the General Manager in order to maintain a credible autonomy from all other operational considerations at the PFSF. The Radiation Protection Manager would be responsible for administering the radiation protection program and for the radiation safety of the PFSF. Radiation protection is addressed in the NRC SER.

In addition to the above dose estimates, actual measurements of dose would be made as work is performed. Constant reviews should be made for actual dose compared with estimated dose for both specific procedures and individuals. Administrative guidelines could be used to determine when corrective action should be taken to reduce doses for either specific individuals or for specific tasks. Radiation protection programs for the proposed PFSF are discussed in Section 7 of PFS's SAR (see PFS/SAR 2000).

4.8 Other Impacts

4.8.1 Noise

4.8.1.1 Noise During Construction

Noise impacts would result from construction equipment and earthwork activities, as well as from additional traffic associated with construction. Earthwork and excavation can generate noise levels up to 95 decibels (dB) in the A range of frequencies [dB(A)], which corresponds to the frequency range of human hearing. This noise level applies at a reference distance of 15 m (50 ft) from the source. Noise levels decrease by about 6 dB(A) for each doubling of distance from the source, although further reduction occurs when the sound energy has traveled far enough to have been appreciably reduced by absorption into the atmosphere. Absorption depends strongly on the frequency of the sound. Low frequencies often associated with construction equipment are typically absorbed at a rate of around 1 dB(A) per km (Campanella 1992).

Construction-related noise levels would be expected to be less than 50 dB(A) in the ambient air at the nearest residences. A noise level of 45 dB(A) has been identified by EPA (1974) as a guideline value for protection from indoor activity interference and annoyance in locations such as schools. That is also about the same as the outdoor background given for a "quiet suburban street" (EPA 1978). Therefore, noise from construction activity would not be expected to be annoying.

Increased traffic associated with construction activities could increase noise levels along Skull Valley Road by 5 dB(A), leading to noise levels as high as 72 dB(A) within 15 m (50 ft) of the road during peak traffic volume; at least two residences are included in this area (PFS/ER 2000). However, the area along Skull Valley Road is almost entirely undeveloped; therefore, community noise impacts in the area are expected to be small. The noise levels involved during peak traffic are in the range where noise can become highly annoying, and an increase of 5 dB(A) could be judged a moderate impact by some individuals. Probably of more importance would be the substantial increase in construction-related traffic throughout the day in this normally quiet area. Therefore, the temporary increase in noise associated with construction traffic would produce moderate impacts along the immediate vicinity of Skull Valley Road.

4.8.1.2 Noise During Operations

Noise resulting from operation of the proposed PFSF would be primarily from mobile sources associated with the delivery of casks. The loudest potential noise source would be a diesel switch engine operating on site. Momentary noise from routine operation could exceed 100 dB(A). Train whistles are often audible at distances greater than 1.6 km (1 mile); however, at greater distances the absorption of sound energy by the atmosphere is no longer negligible, and noise decreases by more than 6 dB(A) for each doubling of distance from the source, especially in the higher frequencies corresponding to a whistle (Campanella 1992). Nonetheless, a train whistle from an on-site switch engine would almost surely be audible at the nearest residence. Low-frequency noise from routine operation of a diesel locomotive could exceed the 55-dB(A) level, recommended by EPA for protection from activity interference and annoyance, for distances up to about 1.6 km (1 mile) from the source. The exact distance would depend on several factors including wind direction at the time. However, these noises would only occur during brief periods when transfer or movement of a cask is taking place. Therefore, noise impacts associated with normal operations of the proposed PFSF are expected to be small.

During construction, noise levels at the nearest residence would be only about 1 dB(A) louder if construction occurred at Site B instead of Site A; therefore, there are no distinguishable differences between the two sites in regard to construction noise impacts. Noise impacts resulting from normal operation of the proposed facility would be small at either Site A or Site B.

4.8.2 Scenic Qualities

Construction and operation of the proposed PFSF would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. Facility construction would create the short-term visual impacts of additional dust from the operation of heavy equipment on-site and additional vehicle traffic on Skull Valley Road. Facility operation would create long-term visual impacts through the contrast of a large industrial facility with the surrounding landscape, the contrast of security lights with the surrounding darkness at night, and the generation of additional vehicle traffic as workers commute to and from the facility on Skull Valley Road.

The proposed action appears consistent with the BLM classification of the surrounding landscape. However, the staff concludes that changes in the scenic quality of the landscape would represent small to moderate impacts to recreational viewers, residents of Skull Valley, and motorists traveling Skull Valley Road. The following analysis explains the BLM perspective and the reasons for the staff's conclusions.

4.8.2.1 BLM Perspective

The BLM administers 56 percent of the land within 8 km (5 miles) of the proposed PFSF site. The BLM evaluates the scenic quality of the land it administers through a "Visual Resource Inventory," the objective of which is "to manage public lands in a manner which will protect the quality of the scenic (visual) values of these lands" (BLM 1984). Through such inventories, BLM classifies land into one of four categories depending on visual resource objectives (BLM 1986):

- Category I: Preserve the existing character of the landscape.
- Category II: Retain the existing character of the landscape.

- Category III: Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- Category IV: Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt would be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Although the BLM does not administer the land on which the proposed PFSF would be located, most of the BLM lands in Skull Valley are classified as Category IV, the lowest category in terms of scenic values. Thus, from the BLM perspective, the proposed PFSF would be consistent with the Category IV classification, which allows for "high" levels of changes to the characteristic landscape.

4.8.2.2 The Staff Analysis

To assess the visual impacts of the proposed PFSF, the staff first identified the most important visual resources in the project vicinity. This was accomplished through a site visit and the use of photographs, maps, and the checklist included here as Figure 4.2. The important visual resources identified by the staff, primarily the undeveloped scenic qualities of the valley and the surrounding Stansbury and Cedar Mountains, are discussed in Section 3.8.2.

Next the staff identified those groups of viewers who would be most affected by visual impacts based on their proximity and exposure to the proposed PFSF and their perceived sensitivity to changes in the surrounding landscape (see Figure 4.2). The staff then evaluated the significance of potential visual impacts to the three primary groups identified–recreationists, local residents, and motorists on Skull Valley Road.

4.8.2.3 Recreational Viewers

As discussed in Sections 3.8.2 and 3.8.3, recreationists in Skull Valley and in areas adjacent to the valley would be able to view the proposed PFSF. Recreationists would access areas along the Stansbury Mountain ridge using the trail to Deseret Peak. The proposed PFSF could be visible from this area (see Figures 4.3 and 4.4). Additional recreationists on BLM lands would be able to view the proposed PFSF from the Cedar Mountains or from areas within Skull Valley. The facility would also be visible to bird watchers along Skull Valley Road (see Figure 4.5).

Recreationists in the Stansbury Mountains and along Skull Valley Road would be most affected by the visual intrusion of the proposed PFSF because it would be more visible from these areas than from the Cedar Mountains or from other areas within the valley. For many recreationists, particularly those seeking wilderness experiences, a large industrial facility in the midst of a scenic and nearly undeveloped landscape would represent a noticeable contrast and a moderate visual impact.

4.8.2.4 Local Residential Viewers

The facility would be the most noticeable manmade structure visible from the Goshute Village (see Figures 4.6 and 4.7). Residents of the village would be the group with the most continuous view of the facility because of their proximity. The overall significance of visual impacts to local residents would likely be moderate.

Figure 4.2. Visual impact identified worksheet.

I. Description of Existing Visual Environment

1. Area surrounding project site can be identified by one or more of the following items:

	Within 1 mile	
Essentially undeveloped	Yes ☒	No ☐
Forested	Yes ☐	No ☒
Agricultural	Yes ☒	No ☐
Suburban residential	Yes ☐	No ☒
Industrial	Yes ☐	No ☒
Commercial	Yes ☐	No ☒
Urban	Yes ☐	No ☒
River, lake, pond	Yes ☐	No ☒
Cliffs, overlooks	Yes ☐	No ☒
Designated open space	Yes ☐	No ☒
Flat	Yes ☒	No ☐
Hilly	Yes ☐	No ☒
Mountains	Yes ☐	No ☒
Other: <u>Limited residential development related to Reservation and surrounding ranches</u>	Yes ☒	No ☐

2. Are there visually similar projects within:

One mile	Yes ☐	No ☒
Two miles	Yes ☐	No ☒
Three miles	Yes ☐	No ☒
Adjacent	Yes ☐	No ☒

II. Degree of Project Visibility

1. Will the project be visible from outside the limits of the project site?	Yes ☒	No ☐
2. The project may be visible from		
Site or structure on the National Register or State Register of Historic Places	Yes ☐	No ☒
Palisades	Yes ☐	No ☒
State or county park	Yes ☐	No ☒
Parkway	Yes ☐	No ☒
Interstate route	Yes ☐	No ☒
State highway	Yes ☐	No ☒
County road	Yes ☒	No ☐
Local road	Yes ☒	No ☐
Bridge	Yes ☐	No ☒
Railroad	Yes ☐	No ☒
Existing residences	Yes ☒	No ☐
Existing public facility	Yes ☒	No ☐
Adjacent property owner(s)	Yes ☒	No ☐
Designated scenic vistas	Yes ☐	No ☐
Other: <u>National Forest, designated Wilderness Area, designated Wilderness study area</u>	Yes ☒	No ☐

Figure 4.2 (continued)

3. Will the project eliminate, block, partially screen, or detract from views or vistas known to be important to the area? Yes ☒ No ☐

4. Is the visibility of the project seasonal? For example, screened by summer foliage, etc. but visible fall/winter/spring? Yes ☐ No ☒

5. How many linear feet of frontage along a public thoroughfare does the project occupy? _0_ feet

6. Will project open new access to or create new scenic views or vistas? Yes ☐ No ☒

7. Does proposed project or action plan to:
   a. maintain existing natural screening Yes ☒ No ☐
   b. introduce new screening to minimize project visibility Yes ☐ No ☒
   If yes, is screening: vegetative ☐ structural ☐

III. Viewing Context

Viewers will likely be in which of the following situations when the project is visible to them?

Activity	Frequency: Daily	Weekly	Holidays, Weekends	Seasonally
Travel to and from work	☒	☐	☐	☐
Involved in recreational activities	☐	☐	☒	☒
Routine travel by residents	☒	☐	☐	☐
At a residence	☒	☐	☐	☐
At worksite	☒	☐	☐	☐
Other: ____________	☐	☐	☐	☐

IV. Visual Compatibility

1. Are the visual characteristics of the project obviously different from those of the surrounding area? Yes ☒ No ☐
   If yes, the visual difference is because of:
   Type of project Yes ☒ No ☐
   Design style Yes ☒ No ☐
   Size (including length, width, height, number of structures, etc.) Yes ☒ No ☐
   Coloration Yes ☒ No ☐
   Condition of surroundings Yes ☒ No ☐
   Construction material Yes ☒ No ☐
   Other: exterior lighting

Source: Adapted from Smardon, Palmer, and Felleman 1986 (as presented in Canter 1996).

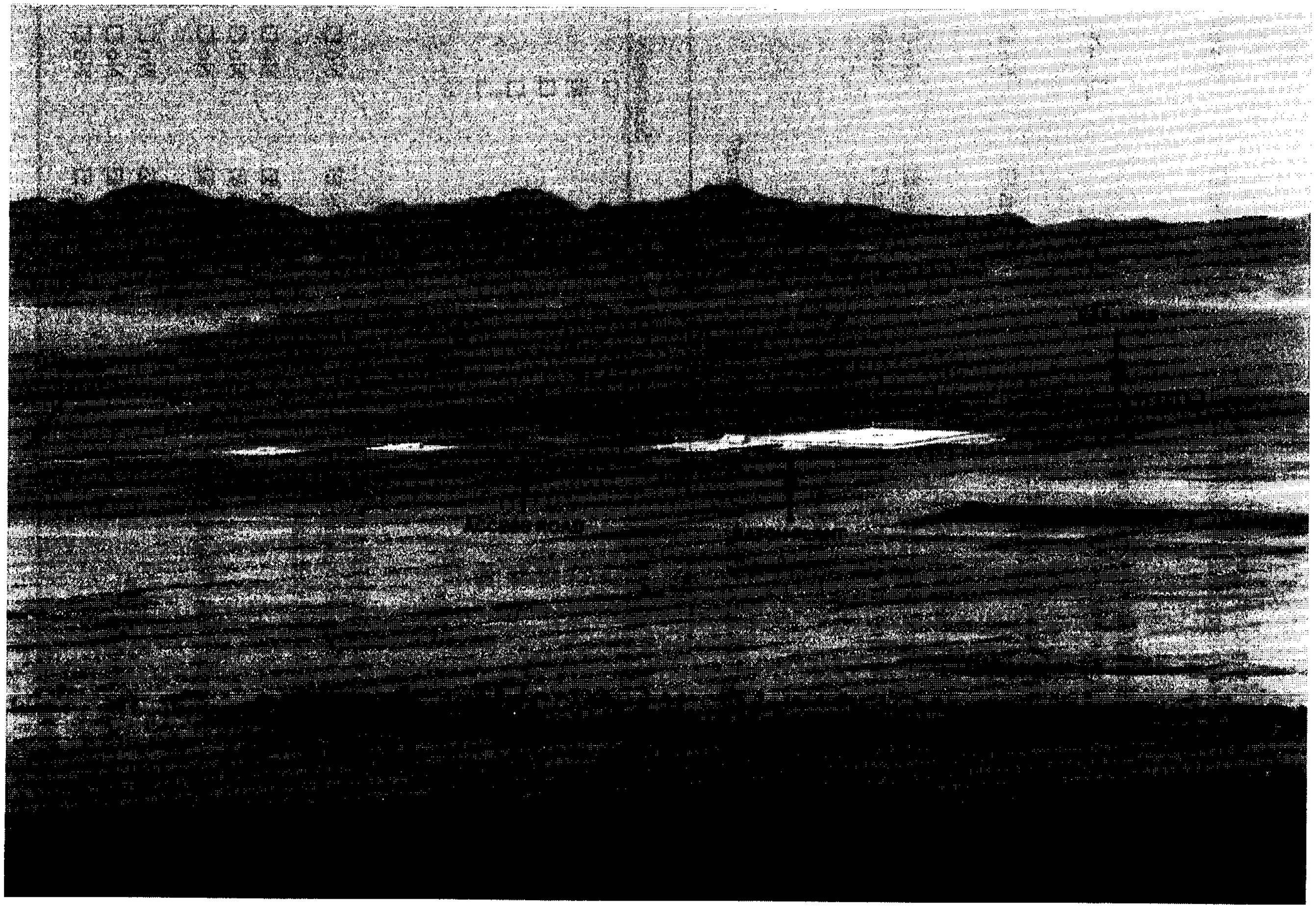


Figure 4.3. Artist's rendering of the daytime view of the proposed PFSF from Deseret Peak.

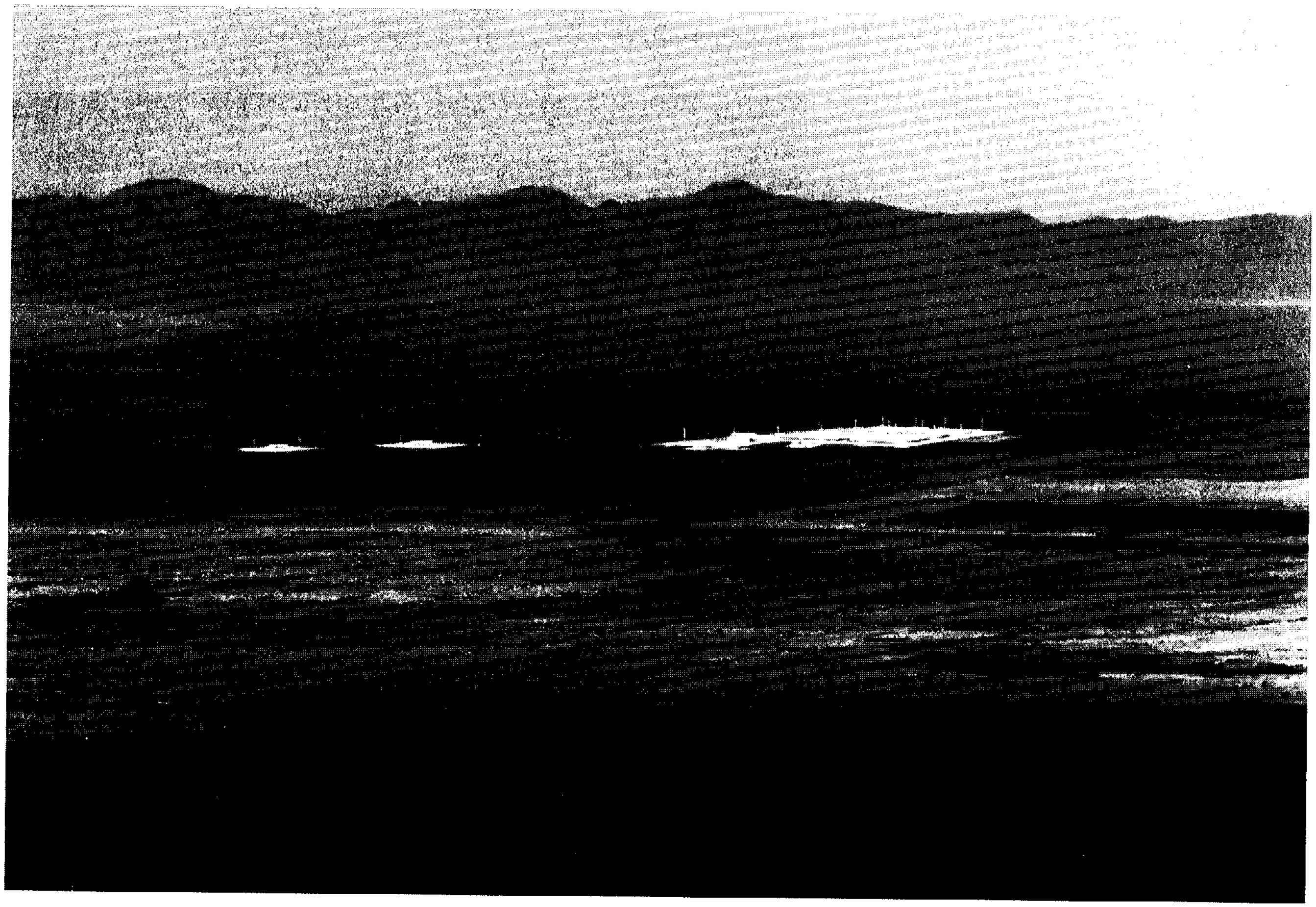


Figure 4.4. Artist's rendering of the nighttime view of the proposed PFSF from Deseret Peak.

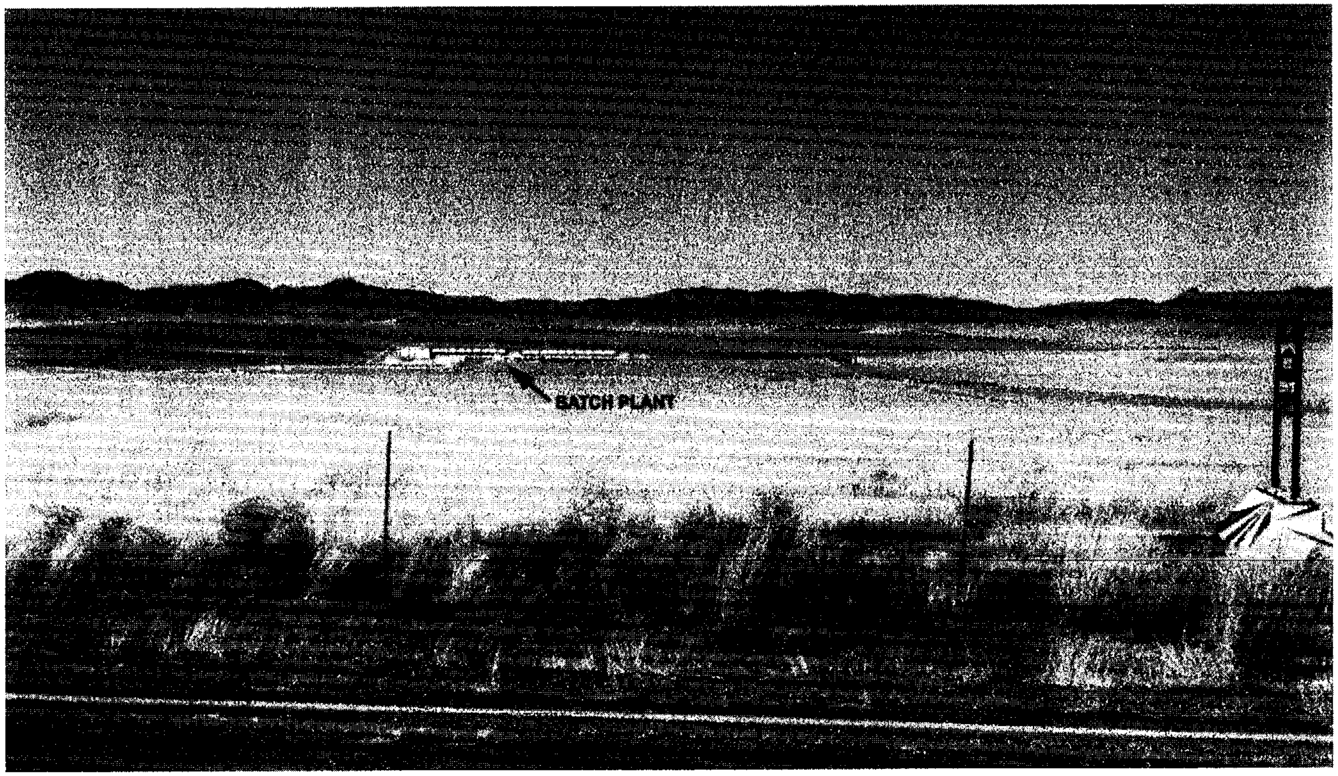


Figure 4.5. Artists's rendering of the daytime view of the proposed PFSF from Skull Valley Road.

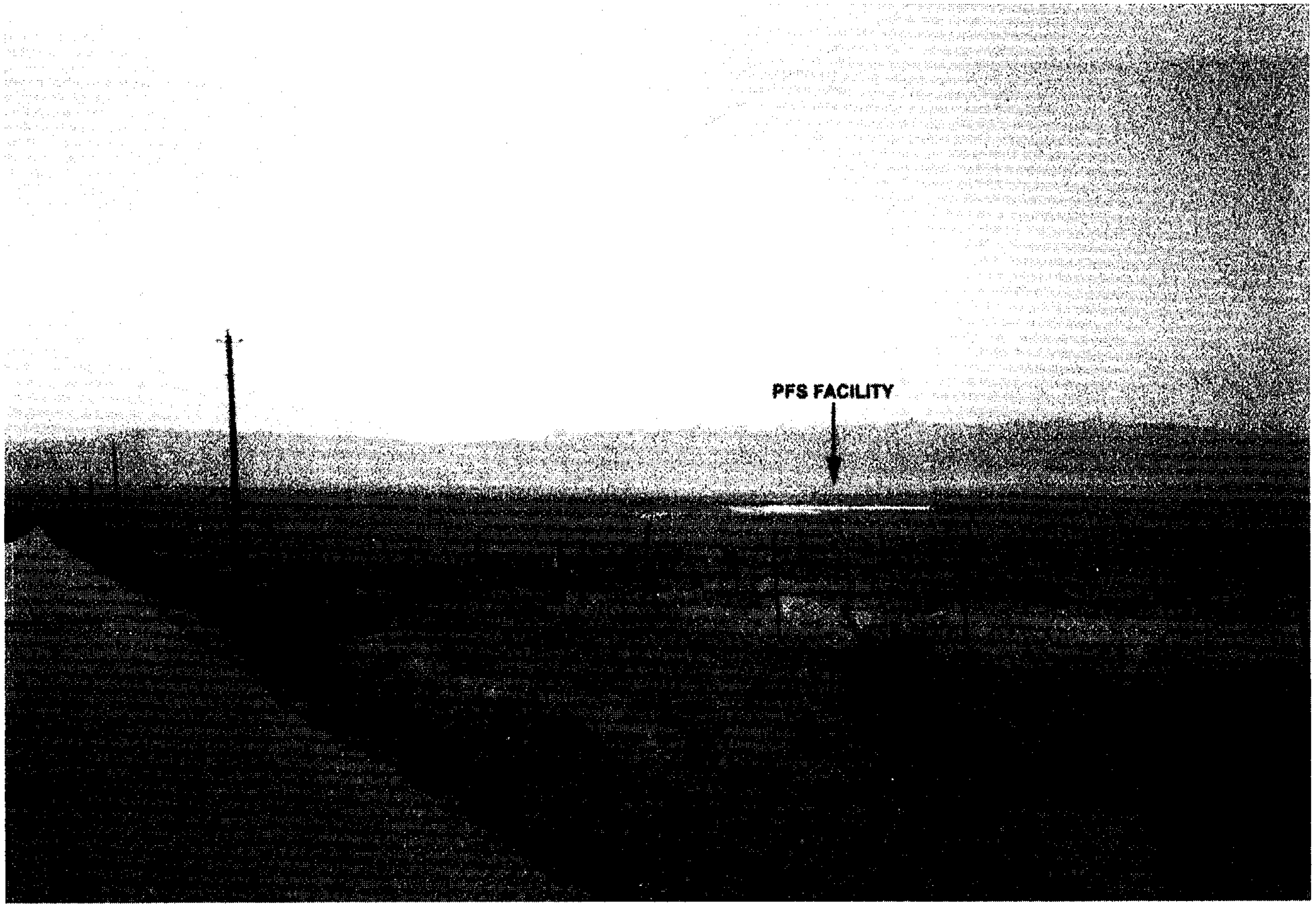


Figure 4.6. Artist's rendering of the daytime view of the proposed PFSF from the Goshute Tribal village.

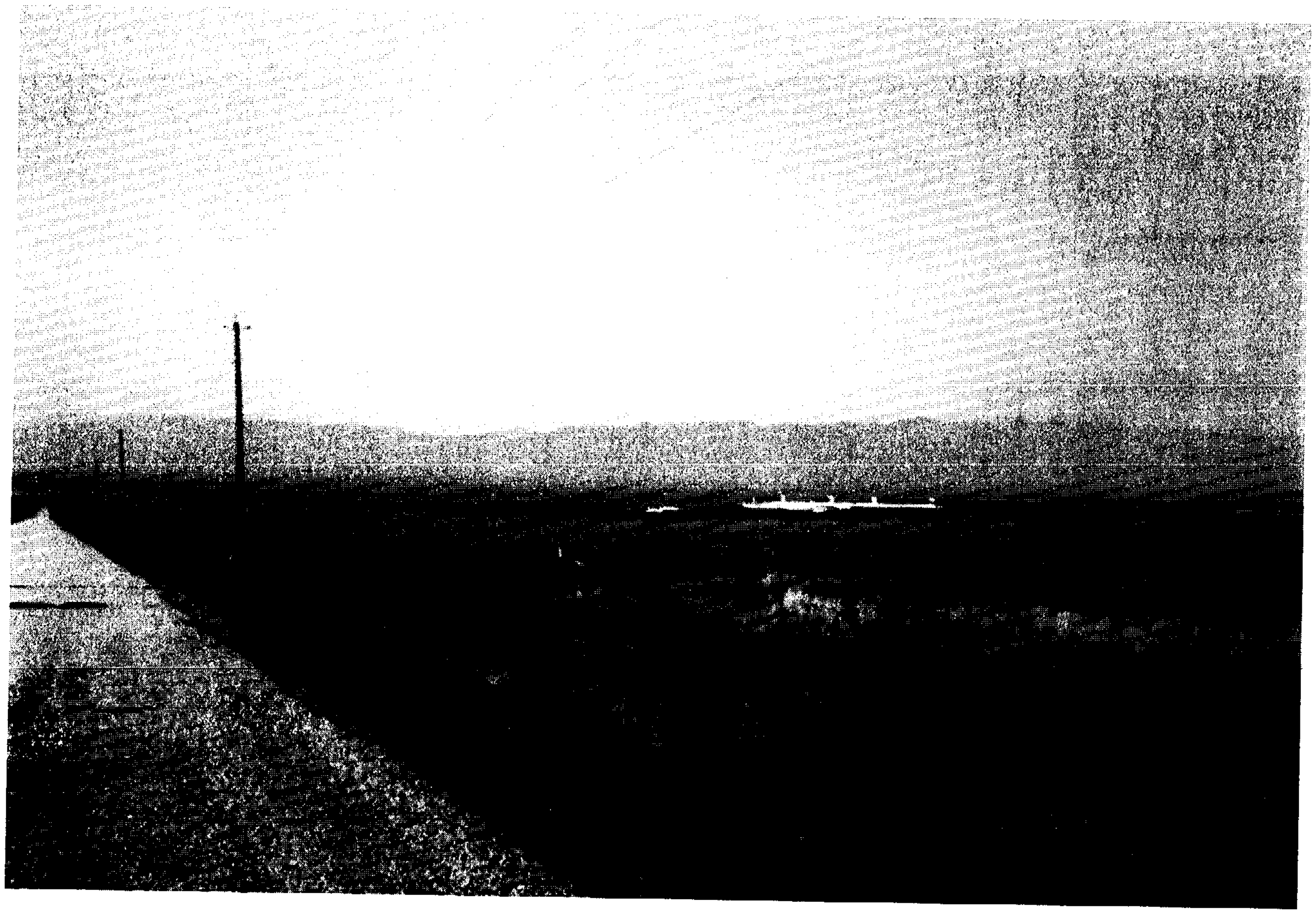


Figure 4.7. Artist's rendering of the nighttime view of the proposed PFSF from the Goshute Tribal village.

4.8.2.5 Motorists on Skull Valley Road

The facility would be highly visible to motorists on Skull Valley Road (see Figures 4.5 and 4.8), with most exposures being to daily commuters connecting to Interstate 80. From Skull Valley Road, the facility would be viewed against the distant background of the Cedar Mountains to the west. The facility would not affect the more scenic views of the Stansbury Mountains and Deseret Peak to the east. The facility would be the most noticeable manmade structure from Skull Valley Road, particularly at night because of the contrast between the security lighting and the surrounding darkness (see Figure 4.8). During the day, delays resulting from increased traffic associated with facility construction and operation could also influence aesthetic perceptions. Overall, it is likely that visual impacts to motorists on Skull Valley Road would be small to moderate because most exposures would be to regular commuters who are not likely to be as sensitive to the facility's appearance as are some recreationists and local residents.

4.8.2.6 The Alternative Site (Site B) in Skull Valley

The alternative site (Site B) is located about 800 m (2,600 ft) south of the proposed site and has very similar visual qualities. Site B would be approximately the same distance from the Goshute Village and Skull Valley Road as the proposed site. Therefore, the visual impacts of constructing and operating the facility at Site B would be similar to the impacts discussed above for the proposed site.

4.8.2.7 Conclusion Regarding Visual Qualities

Skull Valley and the mountain ranges that define the valley offer visual qualities that are very appealing to residents and visitors who appreciate undeveloped natural surroundings. While it is true that relatively few persons would view the proposed PFSF in this isolated location, some of the viewers may be sensitive to the facility's "industrial presence." Thus, because it would be a new industrial development in a nearly undeveloped setting, the facility would represent a small to moderate visual impact.

4.8.2.8 Mitigation Measures

In general, PFS should use any measures available to make the facility less visible to potential viewers. PFS should consult with the BIA and BLM to determine whether planting native vegetation or constructing earthen berms would be useful in screening the facility. PFS should consult with the BIA and BLM to identify colors of paint that would blend facility structures with the surrounding landscape. PFS should implement its proposal to use shielded lights to minimize light diffusion at night.

4.8.3 Recreation

Direct impacts to recreational resources and opportunities are primarily associated with any physical changes to those resources and opportunities that would result from construction and associated activities. Indirect impacts are primarily associated with workers who might move into the area and place additional demands on existing resources and opportunities. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

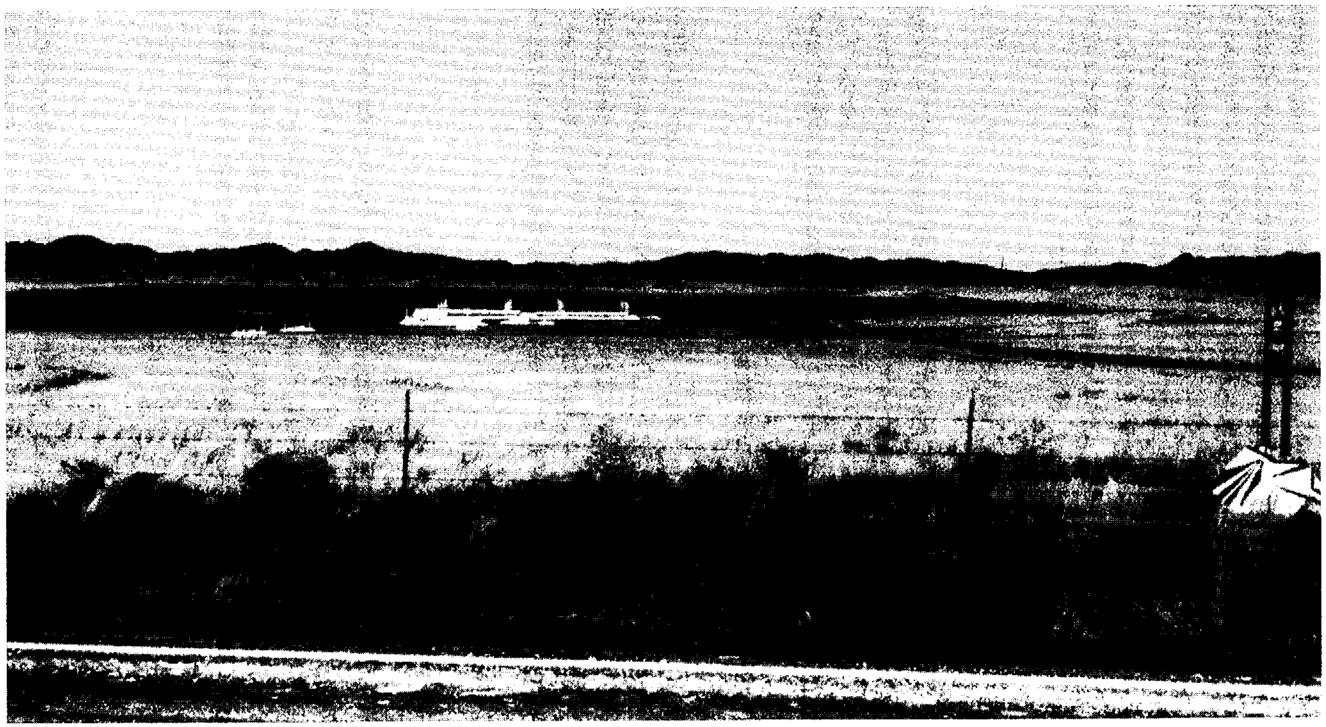


Figure 4.8. Artist's rendering of the nighttime view of the proposed PFSF from Skull Valley Road.

Recreational uses of the land in Skull Valley include such activities as driving off-road vehicles, bird watching, and hiking. Because the site of the proposed PFSF is on tribal trust land, access restrictions for members of the general public already exist. There would be no additional impacts to recreational uses of this property by the general public beyond those that already exist.

Activities associated with construction of the proposed PFSF, including the movement of materials and workers to and from the Reservation, have the potential to affect recreational resources and opportunities. In particular, persons wishing to use Skull Valley Road to access recreational opportunities at Horseshoe Springs or the Deseret Peak Wilderness would need to expect possible delays during the movement of materials and workers on Skull Valley Road (see Section 4.5). These impacts are expected to be greatest during the first part of the first phase of construction, when approximately 300 truck trips per day and 260 construction worker vehicle trips per day are expected. However, the Applicant's use of Skull Valley Road is expected to occur during the week and would not be expected to affect weekend use of Skull Valley Road by recreational users. Impacts during operation of the proposed PFSF (i.e., over the twenty year license of the facility) would be expected to be even smaller, given the much smaller operating workforce associated with the operational period of the proposed PFSF (see Section 4.5).

Since demand on recreational resources varies directly with population, indirect impacts to recreational resources and opportunities are expected to be small because of the small numbers of in-moving workers expected during construction and operation of the proposed PFSF (see Section 4.5). As indicated in Section 4.5, the number of in-moving workers is sufficiently small, even when added to any accompanying family members (approximately 0.3 percent of the Tooele County total population in 1996), that any increased demand placed by those workers and family members on recreational resources and opportunities in Skull Valley or its surrounding areas (e.g., Mount Deseret, the Deseret Peak Wilderness, or the Wasatch-Cache National Forest) should not result in a noticeable effect on them. Because both the direct and indirect impacts of constructing and operating the proposed PFSF are very small (see Section 4.5), impacts to recreational resources are likewise expected to be small.

Given the small magnitude of the impacts to recreational resources and opportunities expected to result from construction of the proposed PFSF, no mitigation measures are warranted.

4.9 Decommissioning and Closure

Decommissioning activities are described in Section 2.1.6; however, the actual actions taken to decommission the proposed PFSF at the expiration of its NRC license period cannot be predicted at this time. At least five years prior to the expiration of the NRC license for the proposed PFSF, a Decommissioning Plan must be prepared and submitted by PFS. The requirements for the Final Decommissioning Plan are delineated in 10 CFR 72.54(g)(1)–(6), 72.54(d), and 72.54(i). This plan will be the subject of further NEPA review that would result in the NRC's preparing an environmental assessment or environmental impact statement, as appropriate, at the time the Decommissioning Plan is submitted to NRC. The discussion of potential impacts in this section is intended to capture the types of impacts that may occur during closure and decommissioning of the proposed PFSF.

The types of impacts that may occur during decommissioning would be similar to those that would accompany the initial construction of the facility. These construction impacts are discussed in Sections 4.1 through 4.8.

As discussed in Section 2.1.6, the fate of the buildings, structures, access roads, and other improvements for the proposed PFSF would be determined by consultation with the Skull Valley Band and BIA prior to termination of the lease for the proposed PFSF. If the Skull Valley Band and BIA elect to have the facility remain intact, then few environmental impacts would be associated with the closure and decommissioning of the facility. If the Skull Valley Band and BIA request the removal of any or all parts of the proposed PFSF, then the impacts similar to those described in the following paragraphs could occur.

4.9.1 Geology and Soils

The crushed gravel between the storage pads would represent an asset that could potentially be recovered and used to offset the loss of this resource that was incurred during the construction of the facility. It is unlikely that the casks, concrete pads, or foundations for the buildings could be recovered for reuse. If they are removed from the site, they are likely to become solid waste items that must be sent to an appropriate landfill for disposal. Any unavailability of mineral resources beneath the site would no longer exist after the proposed PFSF is decommissioned and removed.

Soil used in the construction of the flood protection berms could be used to cover the pads if they are left in place upon facility decommissioning and closure; however, it should be noted that the decommissioning action preferred by BIA would be to remove the storage pads. Assuming little to no elastic soil response to pad unloading, sufficient soil is available in the berms to cover the entire pad area to a depth of slightly over 15 cm (6 inches). However, this would likely not be sufficient for revegetating the area. This would create a gentle topographic rise over the area that, if successfully revegetated, is unlikely to result in an area of enhanced erosion or present an appearance significantly different from the topographic undulations of the valley that currently exist. (See the discussion of ecological resources and impacts below.)

4.9.2 Surface Water and Groundwater

The types of impacts to surface water and groundwater during the closure and decommissioning of the proposed PFSF would be similar to those that would accompany the construction of the proposed PFSF. It is anticipated that water would be required for dust suppression; however, the amounts of water anticipated to be needed during decommissioning activities would be smaller than that needed for construction of the facility, because construction of the facility would require water for concrete construction, and no concrete construction would be needed during decommissioning. Revegetation would also require PFS to water replanted areas. As described in Section 4.2 for construction of the facility, the impacts to surface water and groundwater during decommissioning would be small.

4.9.3 Air Quality

The types of impacts to air quality during the closure and decommissioning of the proposed PFSF would be similar to those that would accompany the construction of the facility. As described in Section 4.3, these impacts would be small.

4.9.4 Ecological Resources

If the concrete storage pads were removed, the 40-ha (99-acre) restricted-access area would be recontoured and actively revegetated with native plant species. The flood protection berms would also be leveled, the storm water detention basin would be filled, and the 6 ha (14 acres) covered by those facilities would be recontoured and revegetated in a similar manner.

Any decommissioned and denuded areas (such as the areas covered by the flood protection berms) would be revegetated in conformance with then-current BIA standards. Careful consideration of the appropriate seed mixes and plants to use, soil conditions, and other measures including a thorough study of site-specific conditions (e.g., elevation, slope, aspect, soil chemistry) would aid in successful site restoration (see Section 4.4).

Removal of the concrete pads and other facilities followed by revegetation of the project area with native plant species would have a positive impact on areas where non-native, invasive plants such as cheatgrass now grow. This reclamation and revegetation would restore, and potentially improve, wildlife habitat, but might require active management for a period of years to ensure success.

If the storage pads were to be left in place, covered with topsoil, and revegetated with native plants, the success of revegetation would be dependent on placing a sufficient depth of soil on the pads and then selecting appropriate native species to plant.

It is likely that 15 cm (6 inches) of soil would not sustain plant life in this part of Skull Valley. Plants from arid environments tend to have deeper roots than those growing in other ecosystems (Canadell et al. 1996). Big sagebrush, for example, growing in Utah has been reported to have roots that reach a maximum rooting depth of 2.2 m (7 ft) (Richards and Caldwell 1987). Species which normally have roots that grow deeper than the depth of the soil placed on the pads would be less likely to survive. Breaking up the storage pads before placing soil on them might create large cracks through which roots could grow. It is BIA's position that 15 cm (6 in) of soil would not be sufficient to allow revegetation. Therefore, BIA proposes the removal of the pads. Use of BMPs as proposed by PFS in Section 2.1.4 and the additional BMPs listed in Section 9.4.2 during decommissioning of the proposed PFSF should keep the impacts on vegetation to a minimum. Revegetation of the proposed PFSF site would restore habitat for some wildlife in Skull Valley.

Based on the assessment of impacts to ecological resources during construction of the proposed PFSF (as discussed in Section 4.4), the impacts of decommissioning are expected to be small.

4.9.5 Socioeconomic and Community Resources

The types of impacts to socioeconomic and community resources during the closure and decommissioning of the proposed PFSF would be similar to those that would accompany the construction of the facility. As described in Section 4.1.5, these impacts would be small.

Perhaps the most potentially significant impact of the closure of the proposed PFSF would be the loss of revenue to the Skull Valley Band (from the lease payments) and to State and local governments (from tax payments). The Skull Valley Band and State and local governments would have sufficient notice of the date of the facility's closure to plan for this loss of revenue.

4.9.6 Cultural Resources

Because no further disturbance of land surface would accompany decommissioning activities, there would be no impacts to cultural resources.

4.9.7 Human Health

As discussed in Section 2.1.6, no radiological contamination of the facility, the storage casks, or storage pads is expected. In the event that residual contamination were discovered, it would be removed from the remainder of the uncontaminated items (as described in Section 2.1.4) and would be disposed as low-level waste in facilities properly licensed for that type of disposal.

Potential worker injuries during decommissioning. The proposed PFSF may be left in place for future Skull Valley Band use. However, should the Skull Valley Band decide the facility should be removed, the staff has assumed that it would take the same amount of time and number of workers to complete the decommissioning activities as it would to originally construct the facility. Thus, the estimates of worker fatalities and injuries for Phase 1 of construction are expected to be applicable to decommissioning. Consequently, there is about a 7-in-100 chance of a fatality and a 51-in-100 chance of nonfatal injury during decommissioning, if decommissioning involves about as much labor as initial facility construction.

4.9.8 Noise

The noise that would accompany the dismantling and removal of any proposed PFSF buildings and structures would be similar to the noise generated by the initial construction of the facility. As discussed in Section 4.8, these impacts would be small.

4.9.9 Scenic Qualities

If the buildings and structures of the proposed PFSF are dismantled and removed from the site, then the scenic qualities of the area would be returned to the state they were in prior to the construction of the facility. This would constitute a favorable impact to the scenic qualities of Skull Valley.

4.9.10 Recreation

Because the site for the proposed PFSF is located on the Reservation, it is unlikely that any changes to recreational opportunities would accompany the closure and decommissioning of the facility. The impacts to recreation would therefore be small.

5. TRANSPORTATION IMPACTS OF THE PROPOSED ACTION

This chapter describes how the natural and human environment could be affected by the construction, operation, and decommissioning of transportation facilities in Skull Valley that route or transfer SNF shipped from U.S. reactor sites to the proposed PFSF. This chapter presents or references relevant data, describes the approach and methods used to predict future environmental effects, and presents an evaluation of the potential environmental impacts.

Each subsection describes, as appropriate, any potential impacts to specific categories of environmental resources. Each subsection also contains a concluding statement as to whether the potential impacts are judged to be small, moderate, or large. The standards used for these concluding statements are presented in the dialogue box on the following page. In addition to a discussion of the potential impacts, the possible mitigation measures that could be employed to eliminate or reduce the magnitude of any impacts are also presented and discussed within each subsection. Each subsection identifies certain of the possible mitigation measures that the cooperating agencies recommend be required. See Section 9.4.2 for a complete list of the mitigation measures that the cooperating agencies recommend be required.

This chapter discusses the impacts of cross-country transportation of SNF (i.e., transporting SNF from U.S. reactor sites) to the proposed PFSF in Skull Valley. PFS member utilities, and possibly utilities that are not members, located throughout the United States could ship SNF to the proposed PFSF. This SNF would eventually be shipped from the proposed PFSF to a permanent repository. Section 2.1.2.1 provides an overview of the transportation activities associated with the proposed action. Most U.S. nuclear power plants are located in the eastern part of the country, and SNF shipment from these reactors to the proposed PFSF would traverse a number of states. Therefore, the environmental impacts associated with cross-country transportation are considered in this DEIS. Because of the size and weight of the SNF shipping casks included in the PFS license application, shipment by rail is the only viable cross-country transportation option. Therefore, the focus of the cross-country transportation analysis in this chapter is on rail transportation.

In addition to cross-country transportation of SNF, this chapter also addresses the impacts of constructing and operating transportation facilities in Skull Valley. The proposed action would include the construction of a new rail siding at Skunk Ridge and a new rail line leading to the Reservation. An alternative method of local transportation is also addressed in this DEIS: the construction of an ITF near Timpie and the use of heavy-haul vehicles on Skull Valley Road. Both the proposed action and the ITF alternative are addressed in this chapter. Decommissioning of the proposed transportation facilities, including rail line abandonment, is also discussed in this chapter. This discussion is based on currently available information; those agencies responsible for transportation facility decommissioning will address that action with further NEPA documentation when those facilities are decommissioned.

Transportation of nuclear materials, including SNF is regulated by both the U.S. Department of Transportation (DOT) and the NRC. The safety of SNF shipments with respect to radiological impacts, especially in the event of a transportation accident, is ensured, in large measure, by the casks that contain the SNF. These casks must meet performance requirements specified in 10 CFR Part 71 and their design must be certified by the NRC.

Other elements of safety are provided for by the DOT's operating requirements for vehicles and drivers. These operating requirements are defined in various parts of 49 CFR.

The Surface Transportation Board (STB) thresholds for environmental analysis are contained in 49 CFR Part 1105. STB's environmental analysis of a proposed rail line covers two broad areas of impact: construction and operation. Construction-related impacts are evaluated for all new rail line constructions. Operation-related impacts are generally evaluated if the volume of traffic generated by the proposed construction exceeds STB's established thresholds.

STB's thresholds for analysis relate to both the number of trains per day and to gross ton-miles to be carried annually by the proposed rail line. Proposed rail line construction that would result in an increase of eight or more trains per day or at least a 100 percent increase in the gross ton-miles carried by the rail line would trigger the need for environmental analysis of operational impacts. Areas currently in non-attainment of Federal Air Quality Standards are subject to a stricter threshold: three trains per day, or a 50 percent increase in gross ton-miles carried.

The proposed PFS rail line would not exceed either of these STB thresholds. However, because of the hazardous nature of the cargo to be carried on the line, STB is considering potential environmental impacts along the proposed rail line and along railroad mainlines. This environmental review includes potential impacts from incident-free shipping, as well as from potential freight accidents and possible subsequent release of radioactive material.

DETERMINATION OF THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

A standard of significance has been established by NRC (see NUREG-1437) for assessing environmental impacts. With the standards of the Council on Environmental Quality's regulations as a basis, each impact is to be assigned one of the following three significance levels:

- ***Small.*** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- ***Moderate.*** The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- ***Large.*** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

5.1 Geology, Minerals, and Soils

5.1.1 Construction Impacts

The environmental impacts to soils and geologic resources would include the loss of a portion of the soils resource, due to its physical alteration during construction, and access restrictions to economic geologic resources located beneath the proposed transportation facilities and their corridors. These alterations lead to a reduction in the soils' ability to support plant and animal life, and may possibly lead to changes in windborne erosion patterns, changes in surface water drainage and erosion patterns, and changes in infiltration characteristics. The impacts to land use and the loss of vegetation and habitat are described in Sections 5.4 and 5.5, windborne erosion impacts in

Section 5.3, surface water drainage and water erosion impacts in Section 5.2, and infiltration impacts in Section 5.2. As discussed below, impacts to the loss of the soils resource and to economic geologic resources would be small.

The assessment for the loss of the soils resource compares the amount of soil to be lost in the construction of the proposed rail siding and the new 51-km (32-mile) rail line with the amount of similar soils resources available in Skull Valley. The assessment of impacts to economic geologic resources (e.g. aggregate) compares the estimated amount of materials required for construction with the availability of those resources in the area. It also considers the impacts to mineral resource exploitation in the immediate area of the proposed PFSF.

5.1.1.1 New Rail Line from Skunk Ridge

The existing soil profile would be altered during construction activities. PFS reports that approximately 95,600 m^3 (125,000 yd^3) of excess material would be generated from surface stripping operations in rail line construction, which would be used to stabilize side slopes (PFS/RAI2 1999). As discussed in Section 2.1.1.3, additional excess material [up to a total of 96,000 m^3 (256,000 yd^3), including the 95,600 m^3 (125,000 yd^3) from surface stripping operations] could also be generated. The estimated amount of spoil generated in rail construction is expected to be reduced during final design, but any excess material would be used as embankment dressing. Thus, there would be no impacts to any potential off-site fill areas or disposal sites. Soils used as slope and embankment dressing could be recoverable upon site decommissioning; thus, the soils resource would not be permanently lost. Impacts to the loss of the soils resource are therefore small.

Table 5.1 compares the amount of construction materials required in rail siding and rail line construction with the amount of material available in the area (see Section 3.1.4). The amount of sub-ballast required [172,000 m^3 (225,000 yd^3)] constitutes nearly 60 percent of the material available from the private sources identified by PFS [300,000 m^3 (393,000 yd^3)]. This would leave sufficient aggregate material available for other uses because five other locations on BLM land exist where additional materials are available. A much smaller fraction (only 17 percent) of the ballast available from the private sources would be used for construction of the rail line. Thus, impacts to these economic geologic resources would be small. Mineral resources located beneath the rail siding and rail line would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region.

5.1.1.2 New ITF Near Timpie

The existing soil profile would be altered during construction activities. PFS reports that approximately 7,100 m^3 (9,300 yd^3) of excess soil (spoil) would be generated from stripping operations in ITF construction, which would be used as slope dressing (PFS/RAI2 1999). Soils used as slope dressing could be recoverable upon site decommissioning; thus, the soils resource would not be permanently lost. Impacts to the loss of the soils resource are therefore small.

Table 5.1 compares the amount of construction materials required for ITF construction with the amount of material available from the private sources identified by PFS. Less than 1.5 percent of the materials available from the private sources would be needed to build the ITF. Because most of this material could be recovered upon site decommissioning, impacts to these economic geologic resources would be small.

Table 5.1. Comparison of transportation facility construction material requirements with quantities of materials commercially available in the vicinity of Skull Valley

Material type	Material required	Material available
Rail corridor from Skunk Ridge		
Sub-ballast	172,000 m^3 (225,000 yd^3)	300,000 m^3 (393,000 yd^3)
Ballast	73,000 m^3 (95,700 yd^3)	438,000 m^3 (572,000 yd^3)
Intermodal Transfer Facility		
Sand	880 m^3 (1,150 yd^3)	300,000 m^3 (393,000 yd^3)
Crushed rock	1,200 m^3 (1,600 yd^3)	465,000 m^3 (607,000 yd^3)
Small road base	500 m^3 (650 yd^3)	300,000 m^3 (393,000 yd^3)
Large road base	2,300 m^3 (3,000 yd^3)	300,000 m^3 (393,000 yd^3)
Subballast	4,100 m^3 (5,400 yd^3)	300,000 m^3 (393,000 yd^3)
Ballast	3,300 m^3 (4,300 yd^3)	438,000 m^3 (572,000 yd^3)
Structural fill	2,000 m^3 (2,700 yd^3)	300,000 m^3 (393,000 yd^3)

Mineral resources located beneath the ITF would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region.

5.1.2 Impacts During Operations

5.1.2.1 New Rail Line from Skunk Ridge

Once the Skunk Ridge rail siding and rail corridor have been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. Extraction of subsurface mineral resources would not be permitted during operation; these resources, if any, would therefore be unavailable during the operational period. As explained above, the impacts from the unavailability of these resources would be small.

5.1.2.2 New ITF Near Timpie

Once the ITF has been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. Extraction of subsurface mineral resources would not be permitted during operation; these resources, if any, would therefore be unavailable during the operational period. As explained above, the impacts from the unavailability of these resources would be small.

5.1.3 Impacts at the Alternative Site B

5.1.3.1 New Rail Line from Skunk Ridge

As discussed in Section 5.1.1 above, impacts to the soils resource or to economic geologic resources would be small. Even though the rail line to Site B would be approximately one mile longer than to Site A and would involve about 10 ha (24 acres) of additional land, the impacts to the soils or economic geologic resources would not differ significantly from those for Site A.

5.1.3.2 New ITF Near Timpie

As described in Section 5.1.2, once the ITF has been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. This conclusion would apply to the proposed facility located at either Site A (i.e., the proposed site) or the alternative site (Site B).

5.1.4 Mitigation Measures

5.1.4.1 New Rail Line from Skunk Ridge

Soils (spoils) used during construction of the rail line from Skunk Ridge for slope dressing could be recoverable upon facility decommissioning and therefore are not lost. Economic geologic resources (e.g. aggregate) used in construction are similarly recoverable. Based on this assessment of the impacts to soils and economic geologic materials, no mitigation measures were identified that would appreciably reduce the effect to these resources.

5.1.4.2 New ITF Near Timpie

Similar to the new rail line, soils and aggregate materials are recoverable upon facility decommissioning, and no mitigation were identified that would appreciably reduce the effect to these resources.

5.2 Water Resources

Transportation facilities that may be constructed in association with the proposed PFSF include the 51-km (32-mile) long rail line along the western edge of Skull Valley and the ITF near Timpie. This section discusses potential hydrological impacts that could result from construction and operation of these two transportation options.

5.2.1 Construction Impacts

5.2.1.1 Surface Water

This section discusses potential impacts to the surface water system from transportation facility construction, including potential effects of channel modifications and potential impacts of flooding during construction. Pursuant to 40 CFR 122.26(b)(14) PFS would be required to obtain a UPDES permit to protect surface waters from pollutants that could be conveyed in construction-related storm water runoff and would be required to prepare a Stormwater Pollution Prevention Plan because the construction of the rail line would disturb more than 2 ha (5 acres).

New rail line from Skunk Ridge. As discussed below, potentially small impacts related to surface water could occur from construction of the rail line from Skunk Ridge. The rail line would be constructed along a route near the base of the Cedar Mountains along the western edge of Skull Valley. The rail route would cross approximately 32 arroyos that would require the installation of 110 culverts (PFS/ER 2000). During construction, soils in and around the channel crossings would be disturbed temporarily and could lead to increased erosion and siltation in the vicinity of the construction site during periods of rainfall or snowmelt. Use of BMPs during construction, as planned by PFS, would control erosion and siltation during construction under normal weather conditions for the area. Potential impacts under flood conditions during construction are discussed in a later section. BMPs for erosion control measures would mitigate the potentially small impacts related to surface water along the rail line during construction.

New ITF near Timpie. Potential impacts to the surface water system related to construction of the ITF would be small because the facility would have no interaction with the surface water system. The ITF would be located approximately 2.9 km (1.8 miles) west of Timpie in the area north of I-80 and south of the mainline railroad. The site occupies a small elevated area with no surface water drainage channels crossing the area. Construction activities would result in stock piles of disturbed soil that would lead to increased erosion, siltation, and sediment under normal weather conditions. Construction BMPs would be capable of controlling erosion and siltation of adjacent areas. Pursuant to 40 CFR 122.26(b)(14), stormwater runoff from the proposed ITF construction site would be controlled under a general permit (i.e., UPDES) with the State of Utah. The UPDES permit is required because the construction of the ITF would disturb more than 2 ha (5 acres) (see Section 1.6.2.3).

Impacts to surface water quality. Potential impacts to surface water quality from construction of the transportation facilities would be small. Foreseeable effects on surface water quality during construction include (1) a spill of vehicular fuel into a surface water channel that contained flowing water, (2) the possible presence of motor oils and grease from construction equipment, and (3) a possible increase in sediment that could affect the quality of surface water runoff from the construction sites. The potential for a spill into a flowing surface water channel along the rail line is considered low because the flow channels involved along the rail line are dry arroyos for much of the year. The potential for surface channel contamination to occur at the ITF site is nearly nonexistent because no surface water flow channels cross the site. In any event, runoff from the rail line or ITF would be controlled under the UPDES permit.

5.2.1.2 Potential Impacts of Flooding

This section discusses potential impacts from flooding during construction, should such an event occur.

New rail line from Skunk Ridge. Potential impacts from flooding during construction of the rail line could be moderate, but the probability of such an occurrence is low. In the event that severe storms occurred during construction activity, there could be erosion of soil from the railroad embankment with consequent redeposition of soil in the downstream channels. Although PFS would use construction BMPs, a severe flood could overwhelm the capability of standard practices to control surface water flows in arroyos draining the Cedar Mountains. The severity of such an impact would vary with the storm intensity. Should severe flooding occur (i.e., storms associated with the 100-year flood event or greater), the eroded materials from the construction site would be commingled with natural sediment transported in the flood flows from areas adjacent to the rail line. The eroded material from the construction site would not cause a significant increase in impacts beyond those caused by natural sediment transport resulting from such an event.

New ITF near Timpie. The ITF would be on a slight topographical rise, approximately 2.9 km (1.8 miles) west of Timpie in the area north of Interstate 80 and south of the existing mainline railroad. The existing elevation of the ITF project area is from 1286.6 to 1288.1 m (4220 to 4225 ft). The ITF itself would be designed nearer the 1289 m (4225 ft) elevation. In 1986 the Great Salt Lake flooded to an historic elevation of 1284.1 m (4211.85 ft), which is well below the ITF area elevation. In addition, the Great Salt Lake Planning Project Draft Analysis of Proposed Management Alternatives, issued by the State of Utah Department of Natural Resources in January 1999, has designated the flood plain of the lake at 1284.15 m (4212 ft) for planning purposes and 1285.7 m (4217 ft) as the extent of the lake's floodplain (PFS/RAI2 1999e). Neither elevation is above the ITF design elevation.

Intense precipitation events could result in increased stormwater runoff at the ITF construction site. This could result in excessive waterborne erosion of spoil piles or piles of construction aggregate. Otherwise, potential flood-relate impacts during construction of the ITF would be small because the facility would be constructed in an area with little to no flooding potential. This stormwater would be controlled under a general permit with the state of Utah (see Section 1.6.2.3).

5.2.1.3 Water Use

This section discusses the water use and potential impacts related to construction of the transportation facilities.

New rail line from Skunk Ridge. Potential water use impacts related to construction of the rail line would be small. Construction of the rail line would require approximately 625 m^3/day (165,000 gal/day) of water during the 15-month construction period [totaling approximately 242,267 m^3 (64 million gallons)] for dust control and to provide water for soil compaction (PFS/ER 2000). This water would be acquired from an offsite source and trucked to the site. As discussed in Section 4.2, PFS has determined that at least one private source of water exists from which water of the required quantity and quality could be purchased to support project construction. Use of water from private supplies would not adversely affect water availability in the area. Water required for concrete culvert construction would be a small volume compared to the overall project water requirement (PFS/ER 2000). Bottled drinking water from offsite sources would be provided for construction workers. Drinking water for personnel during operation would be provided from the PFSF.

Additional quantities of water would be required for the planned revegetation of disturbed areas along the rail corridor. The volume of water needed is dependent upon the method used to revegetate the area. The water requirements will be determined during the development of a final revegetation plan. Therefore, no estimate is available at this time as to how much water would be needed for this purpose. The criteria that would need to be implemented to ensure successful revegetation are described in Section 4.4.5.

New ITF near Timpie. Potential impacts related to water use from construction of the ITF would be small. Water required for dust control during construction of the ITF is estimated by PFS to be approximately 71 m^3/day (18,800 gallons/day) during the construction period and the water would be acquired from offsite sources and trucked to the site. The construction period for the ITF would be approximately 1 year, and the maximum water volume that would be used during this period, based on the available information, would be about 21,200 m^3 (5.6 million gallons). As discussed in Section 4.2, PFS has determined that at least one private source of water exists from which water of the required quantity and quality could be purchased to support project construction. Use of water from private supplies would not adversely affect water availability in the area. Concrete for the gantry crane foundation would be mixed at the batch plant at the proposed PFSF site and water required for this concrete [about 9 m^3/day (2,400 gal/day)] would be obtained at the proposed PFSF site.

5.2.1.4 Groundwater

Potential impacts that could occur to groundwater are expected to be small as a result of construction of the transportation facilities. Groundwater could be affected by stormwater runoff from the site during construction; however, the proposed construction activities would not increase the quantities of runoff. The presence of motor oils and greases from construction equipment, as well as increased sediment, could affect the quality of the runoff, but because small quantities of runoff would be involved, the overall impacts to groundwater quality would be small.

The only foreseeable event that could impact groundwater quality during construction of the rail line or the ITF would be a large accidental spillage of vehicular fuel used by construction equipment for which no mitigative cleanup actions were taken. A large fuel spill would be required to adversely impact groundwater quality at the site because the groundwater table is approximately 39 m (125 ft) below the ground surface and soil retention would hold up the liquid. Furthermore, such spills could be mitigated through implementation of BMPs to clean them up before water quality impacts occur. PFS's current list of BMPs (see Section 2.1.4) does not include a specific commitment concerning spill response.

5.2.2 Impacts During Operations

5.2.2.1 Surface Water

This section discusses potential impacts related to surface water from operation of the transportation facilities including those that would be expected under normal climatic conditions and potential impacts related to flooding.

New rail line from Skunk Ridge. Under normal weather conditions, the potential impacts related to the surface water hydrological system from operation of the rail line would be small. Small local changes in the flow channels would have occurred as a result of construction of the rail corridor and its associated culverts. These culverts would be sized and aligned so as to minimize the significance of any changes to the natural drainage channels. During operation of the rail line, these culverts would intermittently carry water from rainfall and snowmelt. Under normal weather conditions in the area, some sediment accumulation upstream of the culverts could occur after stormflow events, altering channel morphology. Downstream scour would be minimized through use of rip-rap at sites where rapid flow velocities would occur at culvert outlets. PFS's design packages include criteria that specify flow velocity thresholds that require rip-rap to be placed at culvert outlets. Under normal conditions, these features would prevent erosion downstream of the culverts. PFS designed culverts along the corridor to carry the precipitation from a 100 year flood event (Donnell 1999). The use of energy dissipating rip-rap at culvert outlets is a mitigating measure that has been incorporated into the design of the rail access route.

New ITF near Timpie. Under normal weather conditions, the potential impacts related to operation of the ITF would be small because all activities would occur inside a building and there would be no interaction with surface water. During operation of the ITF, stormwater runoff from the site would be controlled. Because of the types of impervious surfaces (i.e., buildings, asphalt, concrete) at the proposed ITF, runoff quantities would be expected to increase at the site. Also, the potential presence of motor oils and grease from vehicles could result in a degraded quality of this runoff as compared to what exists at the site now.

Impacts to surface water quality. Potential surface water quality impacts related to operation of the transportation facilities would be small. No permanent surface water bodies exist near the transportation facilities and therefore, under normal weather conditions, there would be no potential for impact to perennial surface water features. Seasonal surface water flows would occur along the rail line and an accidental spill of locomotive fuel near one of the channel crossings could occur but would be an unlikely event. Should such a spill occur during a season when surface water was present in channels along the rail route, emergency response could intercept and clean up the spill, contaminated surface water, and contaminated soils to mitigate the incident.

5.2.2.2 Potential Impacts of Flooding

This section describes the potential impacts to the hydrologic water system related to the transportation facilities that could result from flooding.

New rail line from Skunk Ridge. Potential impacts that could occur to the surface water system along the rail line in the event of major flooding would be small. The presence of the rail line is not expected to increase flooding downstream but may slightly reduce peak flows downstream during high flows because of temporary pooling of water upstream of culvert inlets. PFS's design for culverts at arroyos along the rail line would accommodate flows up to and including those expected in a 100-year flood without overtopping the embankment. The design incorporates rip-rap to prevent or minimize erosion and scour below culvert outfalls under high flow conditions.

Flows in excess of the 100-year flood could result in overtopping of the railroad embankment at one or more locations. Such an event would possibly erode a portion of the embankment and could contribute to downstream siltation. Such a severe flood could also be accompanied by mudflows or debris flows from the upper arroyos in the Cedar Mountains. Mudflows or debris flows would likely plug the culverts and would accumulate in the area upstream from the railroad embankment. Large flows could cover the railroad and block rail access to the PFSF site until their removal. This potential event is considered to have a low impact, because it would be a natural event and would not be triggered by the presence of the rail line. If such an event occurred, there would be abundant natural damage in the area and the incremental contribution from material eroded from the railroad embankment would be minor in comparison to the naturally derived flood debris.

Similarly, culvert blockage could result from windblown debris (such as tumbleweed); however, if PFS conducts appropriate maintenance of the culverts along the rail line, this impact could be minimized. This maintenance should include periodic inspection and clearing of any obstructions within the culverts.

New ITF near Timpie. Potential impacts related to flooding at the ITF during operation would be small and would be similar to those described in Section 5.2.1.2 for the construction of the facility.

5.2.2.3 Water Use

Potential water use impacts during operation of the transportation facilities would be small. Water use during operation of the rail line would be limited to drinking water for personnel. Bottled water from the proposed PFSF would be provided to the workers. The incremental consumption of water by rail crew members would not have an adverse impact on water availability.

During operation of the ITF, water would be used for drinking and restroom facilities. Water needed during operation of the ITF would be obtained from a local commercial water supplier. Due to the small number of workers (approximately 9–11 people), acquisition of water from a commercial source would not have an adverse impact on water availability.

5.2.2.4 Groundwater

Any potential impacts to groundwater that would occur during operation of either the rail line or the ITF would be small because no groundwater is proposed for use. Accidental spillage of fuel could contaminate soil at some location along the rail corridor. However, this is unlikely because refueling activities would be limited to the rail siding. A spill response action could be taken to prevent any impact to groundwater from such an event. PFS's current list of BMPs (see Section 2.1.4) does not include a specific commitment concerning spill response. During operation of the ITF there is little potential for such releases to impact groundwater quality because the primary activity would be the transfer of SNF casks from railcars to heavy-haul vehicles. The nature of the proposed ITF activities is not likely to cause accidental spills.

5.2.3 Impacts at the Alternative Site (Site B)

Construction and operation of either the rail line or ITF with the proposed PFSF at Site B would produce impacts to surface water and groundwater that would be similar to those of a facility located at Site A. These impacts are described above.

5.2.4 Mitigation Measures

Potential impacts to water quality could occur if a significant accidental vehicular fuel spill occurred during the wet season or if spills occurred but were not cleaned up. An SPCC plan for the rail line or ITF similar to the SPCC plan required for the site (see Section 1.6.2.1) would prescribe methods for minimizing or eliminating the potential impacts from spills. The cooperating agencies recommend that PFS be required to develop a SPCC plan for the proposed rail line or ITF (see Section 9.4.2). To keep the rail line culverts free of windblown debris, PFS should develop a maintenance plan to periodically check them for debris and clean them as necessary. Such a plan will ensure the rail line culverts function as designed and stream flow alterations are minimized. The cooperating agencies recommend this mitigation measure be required (see Section 9.4.2).

5.3 Air Quality

5.3.1 Construction Impacts

As discussed below, the temporary and localized effects of construction could produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. Air quality impacts of operations would be small.

During construction of either the proposed Skunk Ridge rail corridor or the ITF near Timpie, temporary and localized increases in atmospheric concentrations of nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. Particulate matter in the form of fugitive dust emitted from excavation and earthwork would lead to local increases in atmospheric concentrations of PM-10 where construction occurs near Interstate 80. As would be the case for construction of the proposed PFSF (see Section 4.3.1), fugitive dust would be the primary source of impact to air quality during construction of either the proposed Skunk Ridge rail corridor or the ITF near Timpie.

As discussed below, construction of new rail sidings at either Skunk Ridge or Timpie could produce temporary airborne concentrations that exceed the 24-hour PM-10 standard along segments of Interstate 80 that pass near the construction area(s). Such airborne concentrations often occur near road construction areas that involve appreciable excavation/earthwork. Airborne dust in road construction areas can sometimes affect visibility. While such dust is usually not sufficient to create a safety hazard, it can cause annoyance and inconvenience. These types of impacts are discussed below, along with their applicable mitigation measures.

5.3.1.1 New Rail Line from Skunk Ridge

A new rail siding (see Figure 2.4) would be constructed at Skunk Ridge to connect a proposed new rail line with the existing Union Pacific main line. The preferred route for the new rail line would begin near Skunk Ridge and proceed eastward, roughly paralleling Interstate 80, for about 5 km (3 miles) before proceeding southward to a location due west of the proposed PFSF site (see Figure 1.2). From there it would proceed eastward to an area just south of the proposed storage pads (see Figure 2.2). The area of greatest potential PM-10 impact is considered to be along the northern end of the proposed rail line where it would run parallel to Interstate 80. Impacts at that location would be analogous to those from typical road construction, where members of the general public could be exposed to high PM-10 concentrations for brief periods as their vehicles pass through the construction area.

To obtain an upper-bound estimate of PM-10 impact from the construction of the new rail line, a total area of about 24 ha (60 acres), about 5 km (3 miles) long and 50 m (164 ft) wide, was assumed to be simultaneously undergoing heavy construction. Assumptions regarding emissions per unit area and work schedule were the same as those for the analysis of the proposed PFSF construction discussed in Section 4.3. The same model used for modeling effects of site construction [i.e., ISCST3 (EPA 1995)] was applied to obtain the air-quality impacts. The highest modeled PM-10 concentrations along the roadway would occur when the wind is from the west; however, there are no large nearby sources in that direction that would add appreciably to the maximum PM-10 concentrations resulting from construction of the new rail sidings or rail line (e.g., the Magnesium Corporation of America is in a different wind direction). When modeled maximum concentrations from construction of the rail siding and rail line were added to background values to obtain cumulative impacts, the results indicated that the 24-hour NAAQS standard could occasionally be exceeded along portions of the 3-km (2-mile) segment of Interstate 80 nearest to the proposed construction area. It is unlikely that NAAQS (see Section 4.3) would be exceeded at other locations along the highway, including any location near Low or Delle. These temporary and localized effects of construction would be expected to produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. These effects can be mitigated to acceptable levels by dust control measures, such as surface wetting, and by restricting the area under construction at any one time to less than 5 ha (12.5 acres).

5.3.1.2 New ITF Near Timpie

For the proposed ITF (see Figure 2.14), the largest area that would be under construction at any one time was taken as about 4.5 ha (11 acres). The ISCST3 air dispersion model (EPA 1995) and assumptions similar to those used in the analysis of construction of the proposed PFSF and the proposed rail line were applied to the analysis of air quality impacts from this construction. As in those analyses, construction impacts were added to background values of PM-10 concentrations to obtain cumulative impacts. On some days during construction, particulate concentration could exceed the 24-hour PM-10 standard along as much as 650 m (about 0.4 miles) of Interstate 80. If the 24-hour PM-10 standard were briefly exceeded, the location of the stretch of highway affected would depend on wind direction. No airborne concentrations exceeding the annual NAAQS standard would be expected along Interstate 80, even if no mitigation (e.g., sprinkling with water) were applied. These temporary and localized effects of construction are expected to produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. These effects would be mitigated by dust control measures, such as surface wetting.

5.3.2 Impacts During Operations

5.3.2.1 New Rail Line from Skunk Ridge

The types of air quality impacts expected from operation of a rail line are the same as those for the operation of a switchyard locomotive; NO_2, SO_2, PM-10, and CO would be emitted from the locomotive as it passes. However, rail-line impacts would be smaller because locomotives using the rail line would only emit pollutants in one area for a very short period before passing on, while the switchyard locomotive would be operating within the confined area of the switchyard. The analysis of a switchyard locomotive, presented in Section 4.3, provides an upper bound on air-quality impacts of rail line operation. Because the effects of a switchyard locomotive would be expected to be small, air quality impacts associated with operation of the rail line would also be expected to be small.

5.3.2.2 New ITF Near Timpie

Air quality impacts expected from operation of transport vehicles are typical of those from combustion engines used to power locomotives and construction equipment, diesel generators, etc. Emissions of NO_2, SO_2, PM-10, and CO would occur from operation of the ITF, and effects of these pollutants are discussed in Section 4.3. Effects of the ITF operation on long-term air quality would be small because of the infrequent occurrence of cask transfer. Short term effects would involve emissions that would not add appreciably to those from vehicles routinely using Interstate-80. Impacts from the operation of the ITF near Timpie are, therefore, expected to be small.

5.3.3 Impacts at the Alternative Site B

5.3.3.1 Construction Impacts

Site B would be slightly farther than Site A from Interstate 80 and from the nearest existing rail line. This would increase the length of a rail line to the proposed facility by about 2 percent, and would increase the construction activity by a proportionate amount. In addition, the length of travel for construction materials and personnel would also increase during the additional construction. However, this would not be expected to increase the traffic density. The additional distance would not increase the significance of the associated air-quality impacts, which would be small in either case.

5.3.3.2 Impacts During Operations

Site B would be slightly farther than Site A from Interstate 80 and from the nearest existing rail line. This would increase emissions from transportation by an additional 1.6 km (1 mile) or around 2 percent of the distance to the proposed PFSF. Ambient-air concentrations of pollutants along the road or rail line would not be noticeably different; but those routes and associated emission points would extend about 1 km (3,300 ft) farther. This extension would not change the significance level of the air quality impacts, which would be small in either case.

5.3.4 Mitigation Measures

The mitigation measures described in Section 4.3.4 for construction and operation of the proposed PFSF would also be applicable to the proposed transportation facilities in Skull Valley. However, because of the proximity of transportation facility construction to Interstate-80 and the large number of individuals on Interstate-80 who could be exposed to fugitive dust from the construction site, additional mitigation measures are warranted. These measures are described below.

5.3.4.1 Construction Impacts

Air quality impacts from construction of the proposed rail line or ITF would mainly involve fugitive dust resulting from earthmoving activities. Routine sprinkling of disturbed surfaces with water when winds are blowing toward Interstate 80 would reduce human exposure to airborne particulate matter. The application of surfactants or surface crusting agents would also be effective in reducing dust emissions from construction areas. Minimizing the size (i.e., acreage) of active construction areas and/or installing barriers to shield active construction areas from the wind are two additional measures that would reduce the total amounts of dust emitted. The cooperating agencies recommend that PFS be required to develop a program to control fugitive dust during construction (see Section 9.4.2). The program should include one or more of the methods described above.

5.3.4.2 Impacts During Operations

Impacts of operations at the proposed PFSF site, an ITF, and a rail line are similar; all involve small emissions of air pollutants from fossil-fuel combustion. Impacts would be small and could not be reduced appreciably by additional mitigation measures, such as enhanced vehicle emission controls or extensive power engine maintenance campaigns.

5.4 Ecological Resources

The potential impacts on ecological resources of site preparation, construction, and operation of facilities for transporting SNF to the PSF site are evaluated and discussed in this section. Areas of potential concern include construction and operation activities that would disturb or remove vegetation, animals, and wetlands either temporarily or permanently. Direct losses from land disturbance are quantified by determining the amounts of habitat lost as a result of construction activities. Potential impacts on species of special concern, as identified in Section 3.4.3, that are found to reside on or use the areas necessary for the transportation facilities are also evaluated.

Construction and operation of the proposed transportation facilities may create impacts to wildlife including mammals, birds, and nesting raptors. With the implementation of appropriate mitigation measures, impacts as a result of the Skunk Ridge rail line are expected to be small for all these species. If the heavy haul truck transportation alternative were chosen, much less habitat for these species would be disturbed, and, therefore, would also result in small impacts.

5.4.1 Construction Impacts

5.4.1.1 Vegetation

Direct impacts from construction would include clearing existing vegetation and modification of wildlife habitat. Some of the area to be cleared would be covered by the rail line and rail siding at Skunk Ridge; part of the cleared area would be revegetated. None of the area to be cleared at the ITF near Timpie would be revegetated. In addition, fugitive dust from construction could have indirect effects on vegetation. Construction of the rail corridor or ITF near Timpie is expected to have only a small impact on vegetation and would have a beneficial impact (due to the use of native species) along the Skunk Ridge rail line corridor when revegetation occurs following construction.

Table 2.4 presents the amount of land that would be cleared for each of the transportation alternatives. Construction of the Skunk Ridge rail line corridor, the preferred transportation alternative, would require clearing vegetation and grading soil from a total of 314 ha (776 acres) to reach the preferred site (Site A). For this option approximately 63 ha (155 acres) of desert shrub/grass vegetation would remain cleared for the life of the facility; the remaining cleared area (251 ha [621 acres]) would be replanted following construction primarily with native vegetation. For the heavy-haul truck option the area to be cleared would be 4.5 ha (11 acres) for the ITF near

Timpie, none of which would be revegetated. The area to be used for the ITF is the location of the existing Union Pacific rail line, and, as such, it is previously disturbed; hence, any construction activities in that area would have only a small impact on native vegetation.

There are no unique habitats that would be cleared for either the ITF near Timpie or the Skunk Ridge rail corridor. Much of the vegetation that would be cleared includes non-native species such as cheatgrass. Most of the land that would be cleared for the Skunk Ridge rail line corridor would be replanted with native vegetation following construction. The revegetation plan would be similar to that discussed in Section 4.4.1. A detailed revegetation plan would be developed in consultation with BLM during construction (PFS/RAI2 1999). A seed mixture that could be used for revegetation is listed in Table 5.2. The revegetation plan would comply with the latest BLM guidelines on revegetation in effect at that time for details such as soil preparation, type of seed mix, fertilizing, time of year to plant, and watering frequency.

Table 5.2. Seed mixture for rehabilitation of the area cleared for the rail line

Scientific name	Common name	Planting rate kg/ha (lb/acre)
Elymus smithii	Western wheatgrass	3.6 (3)
Stipa hymenoides	Indian rice grass	2.4 (2)
Linum lewisii	Lewis (or blue) flax	1.2 (1)
Atriplex canescens	Four winged saltbush	0.6 (0.5)
Kochia prostrata	Prostrate Kochia (prostrate summer cypress)	0.6 (0.5)

Fugitive dust would be generated during construction, as discussed in Section 5.3. The small, short-term, incremental amount of dust that would be generated from construction activities is expected to only have a small impact on vegetation since vegetation growing in such environments is not sensitive to dust.

5.4.1.2 Wildlife

During the construction of the proposed transportation facilities, wildlife, such as ground squirrels, kangaroo mice, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as gophers and burrowing owl. This reduction of animals and wildlife habitat would have a slightly negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. However, the permanently disturbed area is expected to have only a small negative impact on available wildlife habitat. Even when considering the longest rail line route to Site B, less than 0.3 percent of Skull Valley would be disturbed due to the construction of the railroad corridor. If the heavy haul truck alternative was chosen, the amount of habitat disturbance would be reduced to less than 0.01 percent of Skull Valley, as only the ITF area would require clearing [approximately 4.5 ha (11 acres)].

Because wildlife in Skull Valley do not exclusively use any particular portion of the valley, the presence of the new rail line would not significantly contribute to habitat fragmentation, segregation, or interruption of habitat connectivity. Also, because there are no clearly defined migration or seasonal use patterns for the wildlife in Skull Valley, the new rail line would not significantly affect the movement of wildlife in the valley.

The truck transportation option for Skull Valley would include an ITF near Timpie. There are no unique habitats that would be cleared for the ITF near Timpie; therefore, impacts to wildlife are expected to be small. Because no road widenings are proposed for the Skull Valley Road alternative, impacts to listed species dependent on springs and wetlands to the north of the facility are not expected. These species would include mink, ringtail, speckled dace, Great Basin spadefoot, bobolink, common yellowthroat, snowy plover, Caspian tern, American white pelican, herons, white-faced ibis, and long-billed curlew.

5.4.1.3 Wetlands

There are no wetlands that would be affected by construction of the Skunk Ridge transportation corridor or the ITF near Timpie (see Section 3.4.2.2.) There are no wetlands near the rail corridor or the ITF near Timpie. The largest wetland area in Skull Valley, Horseshoe Springs, is approximately 11 km (7 miles) from the rail corridor, nearly 16 km (10 miles) from the ITF near Timpie location, and approximately 335 m (1,100 ft) from Skull Valley road (see Figure 3.8). Several smaller springs are located near Skull Valley Road. The impact of construction on wetlands for transportation facilities would be small since there are none near any of the proposed construction areas.

5.4.1.4 Perennial and Ephemeral Streams

The construction of the rail line or the ITF near Timpie would have a small impact on streams. The proposed Skunk Ridge rail corridor would cross 32 ephemeral or intermittent drainages (see Section 2.1.1.3). Depending upon the time of year that rail construction occurs, disturbed soils entrained by these ephemeral desert washes could create minor short-term increases in the turbidity of any water in such streams. These impacts on streams would be small. A CWA Section 404 permit from the Corps of Engineers would be needed prior to construction of those sections of the Skunk Ridge rail corridor that would use culverts to cross these areas. Necessary permits are further discussed in Section 1.6 of this DEIS. Runoff from the ITF near Timpie would not enter any streams and, thus, would have a small impact on them.

The proposed new Skunk Ridge rail line would cross many ephemeral streams. These seasonally wet areas are important to many wildlife species and also provide water to roaming mammals, such as pronghorn antelope and mule deer. It is important to protect any streams or wetlands that may occur along the corridor. The new rail line would be designed such that natural drainages would be preserved; hence, any impacts to wildlife associated with a reduction in seasonal wet areas would be expected to be small.

5.4.1.5 Threatened and Endangered Species and Other Species of Special Concern

There are no plant species of special concern that occur in the area of the Skunk Ridge rail line or the ITF near Timpie. Thus, construction of these facilities would have no affect on special concern plant species.

State-listed endangered peregrine falcons have nested a few miles to the east of the proposed ITF site at the Timpie Springs Waterfowl Management Area. Peregrine falcons nesting in this area could use the ITF site for foraging. The construction of the ITF would have a small impact to peregrine falcons because only a small amount of land would be altered at the ITF and it is unlikely that the falcons foraging base (small mammals and birds) would be significantly impacted.

As documented in Section 3.4.3.2, raptors (i.e., hawks, falcons, owls, and eagles) are a group of birds which feed and nest throughout the area of the proposed rail corridor (Stone & Webster 1998; UDWR 1997a; PFS/ER 2000). Many of these birds are State or Federally listed (e.g., ferruginous hawk). Another listed predatory bird, the loggerhead shrike, is also found in Skull Valley. Construction of the rail line could disturb or destroy nesting habitat important to these species. However, with appropriate mitigation measures, impacts to these species are predicted to be small.

Even though hawks nest in trees along Skull Valley Road (Stone & Webster 1998; UDWR 1997a; PFS/ER 2000), the heavy-haul truck alternative is expected to only have small impacts to these birds because no road widening improvements that could impact nest trees are planned for Skull Valley Road.

Habitat for mammals, including the kit fox (a BLM-listed sensitive species) would be affected due to construction of the Skunk Ridge rail line. The kit fox may be displaced or forced to change movement patterns. Since the amount of affected habitat is a very low percentage of the available habitat in Skull Valley, impacts to the kit fox are predicted to be small.

Skull Valley pocket gophers may also be displaced or destroyed as a result of the construction of the Skunk Ridge rail line. With the implementation of surveys prior to construction, anticipated impacts to these gophers would be small.

5.4.2 Impacts During Operations

5.4.2.1 Vegetation

There would be no direct impacts on vegetation during operation of the Skunk Ridge rail corridor or ITF. Other potential impacts for the rail line corridor include additional wildfires from equipment sparking (PFS/RAI2 1999) as has been reported to occur elsewhere in the west (AmeriScan 1999).

Since revegetation of the rail corridor after construction would be required to follow BLM's fire management plan for Skull Valley (see Section 3.4.1.1), it would be possible for the rail corridor to function as a green strip to help prevent the spread of both wildfires and those caused by operation of the rail line. Planting a mixture of primarily native species along the corridor as listed in Table 5.2 would have a beneficial impact on the local ecosystem and biodiversity. Thus, the planting of species that both retard fires and also rehabilitate areas where invasive annuals are growing could benefit vegetation by increasing biodiversity and improving local ecosystems.

During operation of the rail line PFS would need to control noxious weeds and other non-native species within the rail corridor. PFS would use herbicides to control noxious weeds. EPA's labeling requirements control when and under what conditions herbicides can be applied, mixed, stored, or used (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). By following these requirements, PFS would ensure that the impacts on non-target vegetation from the use of herbicides during the operational lifetime of the rail line would be small.

5.4.2.2 Wildlife

The Skunk Ridge rail option would bisect areas between the western edge of Skull Valley and the Cedar Mountains. There are no wintering or fawning areas for pronghorn antelope or mule deer along this route; however, both species use these areas. Truck or rail traffic could cause roaming wildlife to sometimes adjust their movements and migration patterns. However, these impacts are expected to be small.

Wildfires are frequent occurrences in Skull Valley. If the rail option is implemented for the PFS project, there may be an increase in the frequency of these fires (see Section 5.8.4). Certain wildlife species that are not very mobile (i.e., small mammals and certain nesting birds) could be killed as a result of the increased frequency of fires. More mobile species would be able to avoid the fires. Cheatgrass has become a dominant plant species in Skull Valley. This habitat is considered a threat to the desert populations of the golden eagle in north-central Utah, because cheatgrass invasion in combination with wildfires results in the reduction of jackrabbit populations (Bednarz 1999; USDI 1996; Keller et al. 1998). Jackrabbits are an important food source for golden eagles. If the frequency of wildfires does not increase significantly above current levels, impacts to small mammals and those species dependent on small mammal prey species would be expected to be small because their species and their habitat would not be significantly affected by operation of the rail line. As set forth in Section 5.4.2.1, revegetated areas of the rail line corridor may function as a green strip to help prevent the spread of wildfires. Accordingly, impacts to small mammal prey species and, consequently, golden eagles are expected to be small.

5.4.2.3 Wetlands

There are no wetlands that would be impacted by operation of the Skunk Ridge transportation corridor. The major wetland area in Skull Valley, Horseshoe Springs, is approximately 11 km (7 miles) from the Skunk Ridge transportation corridor. There are no wetlands along the rail corridor itself. Thus, the impact on wetlands of corridor operation would be small.

5.4.2.4 Perennial and Ephemeral Streams

The operation of the rail line or an ITF near Timpie would have a small impact on streams. The proposed Skunk Ridge rail corridor would cross a number of ephemeral or intermittent drainages, but operation of the rail line would have only a small impact on them because the rail line would be designed such that natural drainages would be preserved. There are no perennial or ephemeral streams near the site for the ITF.

5.4.2.5 Threatened and Endangered Species and Other Species of Special Concern

There are no plant species of special concern that occur in the area of the Skunk Ridge rail line or the ITF near Timpie. Thus, the impact on special concern plant species of operating those facilities would be small. Listed wildlife species, from time to time, would need to adjust their movement patterns due to either the rail line or heavy-haul transport. This impact is considered to be small.

5.4.3 Impacts at the Alternative Site B

Direct and indirect impacts of construction and operation of either transportation option to Site B would be essentially the same as those for the proposed site (Site A) as discussed in Sections 5.4.1 and 5.4.2.

5.4.3.1 Vegetation

The Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would require 10 ha (24 acres) more land to be cleared than the route to Site A for a total of 324 ha (800 acres). While the impacts along this transportation corridor would be similar to those described in Section 5.4.1 for the route to Site A, the spatial extent of such impacts would be somewhat greater but still small.

5.4.3.2 Wildlife

The potential impacts to wildlife species as a result of construction and operation of rail line or the heavy haul truck route would be similar to those of the proposed action. With the appropriate mitigation employed, all potential impacts are predicted to be small.

5.4.3.3 Wetlands

The impacts on wetlands of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.3.4 Perennial and Ephemeral Streams

The impacts on perennial and intermittent streams of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.3.5 Threatened and Endangered Species and Other Species of Special Concern

The impacts on plant and wildlife species of special concern of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.4 Mitigation Measures

5.4.4.1 Vegetation

BMPs described in Table 2.7 should be used for construction of the rail line or ITF near Timpie. A mixture of the plant species listed in Table 5.2 should be planted along the rail corridor to revegetate it following construction. In addition to the seed mix, the revegetation plan should follow guidelines currently used by BLM, such as the Interagency Forage and Conservation Planting Guide for Utah, EC 438, or other current guidelines. All of these species, except prostrate Kochia (*Kochia prostrata*), are native species, and all except Lewis flax (*Linum lewisii*) have a high fire tolerance (USDA NRCS 1999). Planting a mixture of primarily native species along the corridor as listed in Table 5.2 would have a beneficial impact on the local ecosystem and biodiversity and should be investigated when the revegetation plan is being finalized. Qualified personnel who are familiar with the local area should be specifically consulted. In addition to individuals from the local BLM office, consultation with staff of the Forest Service's regional facilities and at area universities would help identify native species to use. The cooperating agencies recommend this mitigation be required (see Section 9.4.2). (See Section 4.4.5 for a discussion of the use of native species in revegetation.)

PFS would be responsible for the control or eradication of noxious weeds within the rail line right-of-way. Noxious weeds could be controlled by using herbicides, biological controls, or mechanical clearing. The use of herbicides should be restricted to as small an area as necessary. Herbicides must also be applied at the proper stage of plant growth to be effective (Whitson 1998). Herbicides must be used in compliance with all applicable laws, including EPA's labeling instructions for prescribed environmental conditions (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). The cooperating agencies recommend that PFS be required to consult with BLM prior to construction in order to develop an adequate plan for controlling noxious weeds during the operational lifetime of the proposed rail line (see Section 9.4.2). This consultation should be coordinated with the consultation with BIA regarding the use of herbicides during operation of the proposed PFSF. The plan should include an approved list of herbicides and consideration of non-chemical (e.g., biological) means of controlling noxious weeds (BLM 1991). It should incorporate BLM's most recent standard stipulations for chemical treatment (i.e., spraying) of vegetation (e.g., see Appendix 5 in BLM 1983).

5.4.4.2 Wildlife

Prior to construction, a survey for Skull Valley pocket gopher burrows should be conducted. If burrows are located within 30 m (100 ft) of any proposed construction along the rail corridor or at the ITF site, BLM should be notified. BLM would determine the significance of the location (e.g., is it within the middle of a gopher town, or an isolated burrow on the edge of the gopher town). Specific mitigation measures would be based upon that determination, and could range from relocation of the rail line if it is within the middle of a gopher town to allowing construction to continue if the rail line only intersects the outside boundaries of a gopher town. The cooperating agencies recommend PFS be required to survey, prior to construction, the proposed rail line corridor for pocket gophers (see Section 9.4.2).

To help minimize impacts to the movements of pronghorn antelope and mule deer, as well as other wildlife species, provisions should be made in the railroad design to allow for a number of wildlife crossings, over or under the rail line. The final design for such crossings will be developed in consultation with BLM as part of the right-of-way approval process.

Activities associated with rail line construction could affect nesting success or raising young birds. Before construction begins, PFS should complete a survey for raptor nests (including hawks, owls, eagles, and the loggerhead shrike) within 0.8 km (0.5 mile) of the vicinity of the new rail transportation corridor. If the survey indicates active nests are present, construction activities should be curtailed or restricted during the period from April 1 to August 15 (Stone & Webster 1998; UDWR 1997) to avoid affecting nesting success or raising young. If the raptor surveys reveal that there is great horned owl or golden eagle nesting within 0.8 km (0.5 mile) of the proposed rail line corridor, construction activities should be similarly curtailed or restricted during the period from February through August (UDWR 1997). The cooperating agencies recommend PFS be required to survey, prior to construction, the proposed rail line corridor for raptors (see Section 9.4.2).

5.5 Socioeconomic and Community Resources

The potential socioeconomic impacts and impacts to community resources of two local transportation options have been assessed: (a) constructing and using a proposed new rail line from Skunk Ridge to the proposed PFSF and (b) constructing a new ITF near Timpie and using heavy-haul vehicles on the existing Skull Valley Road. Both the direct and indirect impacts to socioeconomic and community resources during construction and use of these local transportation options to the proposed PFSF are primarily associated with workers who might move into the area and use of heavy-haul vehicles on Skull Valley Road or the use of the rail corridor also result in impacts. Impacts to the socioeconomic and community resources of the Skull Valley Band and their Reservation are indistinguishable from those to the remainder of Tooele County with the exceptions of population, land use, and economic structure. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussion, as appropriate.

These impacts are summarized in Table 5.3, and as discussed in the following paragraphs, would be small.

Table 5.3. Potential impacts to socioeconomic and community resources during the construction and use of new transportation facilities in Skull Valley

Category of potential impact	Significance level of potential impact	
	New rail siding and corridor	New ITF near Timpie
Population	Small	Small
Housing	Small	Small
Educational system	Small	Small
Utilities	Small	Small
Solid waste	Small	Small
Transportation and traffic	Small	Small
Land use	Moderate	Small
Economic structure	Small (but beneficial)	Small (but beneficial)

The overall approach to the assessment of impacts to socioeconomic and community resources is described in Section 4.4. It involves the development of an estimate of the number of construction workers that might move into the area. Both direct construction jobs and indirect jobs are considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled into the existing school system. These increased numbers of people in the local area serve as the basis for determining impacts to socioeconomic and community resources during all phases of construction. The analytical approach and method (of determining the potential number of in-moving workers) are described for the new rail line and the alternative ITF in Sections 5.5.1 and 5.5.2, respectively.

5.5.1 Construction Impacts

5.5.1.1 New Rail Line from Skunk Ridge

During the 14-month construction period for the rail line and its associated siding, an estimated peak work force of 125 workers would be required for various tasks. The bulk of the manpower would be for earthwork. This portion of the work is estimated to take approximately 109 workers including equipment operators, laborers, electricians, iron workers, concrete finishers, and construction supervision staff. The remainder of the work involves preparing the route for the rail line and laying the track; approximately 16 workers would be required to support the track-laying machine. The number of workers required to operate the proposed rail line is incorporated into the work force for operation of the proposed facility itself (see Section 4.5.2).

Following the same approach and using the same assumptions in the assessment of socioeconomic impacts of constructing the proposed PFSF (see Section 4.5.1), if 30 percent of the direct workforce (approximately 38 workers) moves into the area, and approximately 60 percent of those (23 workers) were accompanied by families (with a family size of 2.87), the local population would increase by 81 residents in 38 households due to direct employment. This translates into 15 workers unaccompanied by family, 23 workers accompanied by family, and 43 family members of construction workers. The construction of the rail line would also result in approximately 62 indirect jobs, with six of those workers moving into the area during the construction period. Assuming that 60 percent of these workers bring families and that the average family size would be 2.87, an upper bound of 14 new residents in six households would be expected as the result of indirect employment. Combining the above direct and indirect in-moving persons yields a total of 95 new residents in 44 households as an upper bound. Unaccompanied workers would live in 17 of these households while the other 27 households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/demographics/household.htm), it is expected that 19 additional children would be added to local schools.

Population. Impacts of construction of the rail line to the population levels of Tooele County are expected to be small. Workers who move to the impact area during construction of the new rail line would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed rail line and to housing and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment during construction of the proposed rail line might decide to live on the Reservation. The precise distribution of inmovers would be determined by a number of factors, including proximity to the proposed rail line and the availability of housing and public services. The 95 new residents used as an upper bound in this analysis would represent an increase of 0.3 percent to the 1996 population of Tooele County. If all of these inmigrants located in either Grantsville or Tooele, the population increase would be 1.9 percent in Grantsville or 0.6 percent in Tooele. While growth of this magnitude could be readily accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

Housing. Any housing impacts from construction of the rail line are expected to be small. Construction workers would need to seek housing in nearby towns because BLM will not permit camping or temporary trailers on public lands. The 44 new households used as an upper bound in this analysis would represent 12.6 percent of the vacant housing units, not counting housing units in Wendover or Dugway, that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced inmovers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities. Accordingly, any housing impacts are expected to be minimal.

Education. The impacts to the existing education system during construction of the rail corridor are expected to be small. The addition of 19 new school-age children would increase enrollment in Tooele County by only 0.23 percent. Even in the highly unlikely event that all inmovers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1 percent, 2.6 percent if all new students were enrolled in the Tooele Junior High School, or an increase of 1.3 percent if all new students were enrolled in the Tooele High School; similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 2.5 percent in the elementary school, 3.6 percent in the middle school, or 2.4 percent in the high school. It should be noted, however, that the Tooele County School District has already embarked on a significant expansion of its capacity, so that any additional increase would not place demands on the system that have not already been anticipated.

Utilities. The impacts of constructing the rail line on the provision of water and other utilities within Skull Valley, including impacts to the Skull Valley Band, are expected to be small. The addition of 44 new households and 95 new residents is not expected to strain existing utilities within the impact area, since most if not all of those inmovers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley).

Solid and sanitary waste. Impacts to solid waste management are expected to be small to non-existent. Clearing of the right-of-way would involve the removal and disposal of vegetation along the 12-m (40-ft) wide rail bed, at cut and fill areas, and at soil stockpile locations within the temporary use areas. Woody vegetation would be shredded and scattered in place. Sanitary wastes would be managed with conventional systems, such as portable toilets.

Transportation and traffic. Impacts to transportation by construction of the rail line are expected to be small. Construction of the rail line and siding would require the movement of large quantities of excavated soils and ballast and sub-ballast as well as workers to construction areas. It is anticipated that most materials and workers would travel to the site of the proposed rail siding by way of Interstate 80. PFS has indicated that materials and workers would travel to each point of construction by way of the rail line as construction proceeds along the proposed route. Nothing would prevent PFS from transporting materials and workers on unimproved roads (i.e., dirt) that are adjacent to the rail corridor. If PFS uses these dirt roads frequently or to transport heavy materials, the roads would degrade and become impassable because of the type of soils in the area (see Section 3.1). If PFS determines that it is necessary to use the dirt roads, action should be taken to minimize the impact.

As noted in Section 2.1.1.3, an attempt would be made to balance the expected volume of cuts and fills to minimize the need for additional fill material. With such an effort, a surplus of approximately

196,000 m^3 (256,000 yd^3) of material could be generated. In addition to the movement of excavated soils, which would have minimal impact on transportation due to the intent to keep such materials near the point of generation, construction of the proposed rail line and siding would require approximately 245,000 m^3 (320,000 yd^3) of ballast and sub-ballast (composed of crushed gravel or rock) to be obtained from one or more existing commercial gravel pits in the area. Assuming a per-truck capacity of approximately 15.3 m^3 (20 yd^3) (PFS/ER 2000) for movement of the ballast and sub-ballast, a total of approximately 32,000 truck trips would be required to transport the ballast and sub-ballast (a truck trip, or vehicle trip, is defined as a single one-directional vehicle movement; hence, a vehicle arriving and departing the point of delivery constitutes two vehicle trips). Assuming that these 32,000 trips are made evenly throughout 12 months of the 14-month construction period, there would be approximately 134 truck trips per day (67 trucks going each way on Interstate 80 to and from the point of ballast and sub-ballast delivery) or approximately 13 vehicles per hour.

In addition to ballast and sub-ballast deliveries, a peak construction work force of 125 workers would commute to and from the construction site in individual passenger vehicles and light trucks on a daily basis. These workers could account for an increase of 250 vehicle trips per day on Interstate 80 during construction of the rail line and siding. All together, construction of the rail line and siding could result in an increase of 384 vehicle trips per day on Interstate 80 (250 vehicle trips per day for the construction workers and 134 vehicle trips per day for the ballast and sub-ballast delivery). This increase amounts to approximately 4.5 percent greater use of Interstate 80 than had been experienced in 1995 (see Section 3.5.2.4). This additional traffic volume would have a negligible effect on the level of service on Interstate 80 but could have adverse effects on the movement of traffic onto and off of the interstate. This adverse effect on feeders to and from Interstate 80 also results from delivery trucks moving at a slower rate of speed before entering and after leaving Interstate 80 than other traffic, requiring other traffic to reduce travel speed.

Land use. Impacts to current land use from construction of the rail line are expected to be moderate. The proposed right-of-way between Skunk Ridge and the proposed facility crosses public land administered by BLM's Salt Lake Field Office. Construction of the rail line could result in some reduced use of this resource by members of the public (Section 5.8.3). In addition, some grazing activities on the Eightmile and Black Knoll Pastures of the Skull Valley grazing allotment might be temporarily curtailed during construction of the rail line from Skunk Ridge but should return to pre-construction levels following construction.

The proposed rail route through Skull Valley would disrupt livestock movement between bench areas and cheatgrass flats. Since water is predominantly located west and above the proposed route in most areas, grazing would be intensified along the bench areas, resulting in greater utilization and potential rangeland degradation. Wild horse use in this area is also quite significant, and the proposed rail line could have a similar effect on their use of these bench areas.

The proposed route would cross two Pasture and Allotment division fences. The fences run east-west across the valley. The route would also cross several unimproved roads which are equipped with cattle guard crossings to prevent livestock movement between pastures. PFS plans to include cattle guards along the rail route wherever the route crosses Pasture and Allotment division fences. Three livestock water pipelines also cross the rail route line; provision would be made to keep them serviceable.

Economic structure. Because the construction workforce (direct and indirect) would be only 125 people and the construction period would be 14 months, the effect of the proposed action on the economic structure of the local area would be small, but favorable. The unemployment rate in Tooele County has the potential to fall slightly in the impact area due to the hiring of current residents and the in-moving of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by tribal members would constitute a positive impact on the tribal economy.

5.5.1.2 New ITF Near Timpie

Construction of the ITF and its associated rail siding and access road would require an estimated peak work force of 35 workers and would be performed within one year of issuance of an NRC license for the proposed PFSF. The bulk of the manpower would be for earthwork, pouring the building foundation, erecting the gantry crane and metal building, installing building electrical and mechanical infrastructure, laying railroad track, paving the access road, and installing site fencing. The work force would include equipment operators, laborers, electricians, iron workers, concrete finishers, and construction supervision staff.

Following the same approach and using the same assumptions in the assessment of socioeconomic impacts of constructing the proposed PFSF (see Section 4.5.1), if 30 percent of the direct workforce (approximately 11 workers) moves into the area, and approximately 60 percent of those (seven workers) were accompanied by families (with a family size of 2.87), the local population would increase by 24 residents in 11 households due to direct employment; this translates into four workers unaccompanied by family, seven workers accompanied by family, and 13 family members of construction workers. The construction of the rail line would also result in approximately 18 indirect jobs, with two of those workers moving into the area during the construction period; assuming that one of these workers brings a family and that the average family size would be 2.87, an upper bound of four new residents in two households would be expected as the result of indirect employment. Combining the above direct and indirect in-moving yields a total of 28 new residents in 13 households as an upper bound. Unaccompanied workers would live in five of these households while the other eight households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/demographics/household.htm), it is expected that six additional children would be added to local schools.

Population. Impacts of construction of the ITF to populations levels in Tooele County are expected to be small. Workers who move to the impact area during construction of the ITF and associated siding would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed site for the ITF and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment during construction of the ITF might decide to live on the Reservation. The precise distribution of inmovers would be determined by a number of factors, including proximity to the proposed ITF and the availability of housing and public services. The 28 new residents used in this analysis as an upper bound would represent an increase of less than 0.1 percent to the 1996 population of Tooele County. If all of these immigrants located in either Grantsville or Tooele, the population increase would be 0.6 percent in Grantsville or 0.2 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

Housing. Any housing impacts from construction of the ITF are expected to be small. The 13 new households used as an upper bound in this analysis would represent approximately 3.8 percent of the vacant housing units, not counting housing units in Wendover or Dugway, that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced inmovers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities.

Education. The addition of six new school-age children would increase enrollment in Tooele County by only 0.07 percent. Even in the highly unlikely event that all inmovers would locate in a single community, the increases in enrollment would be very small.

Utilities. The impacts of constructing the ITF on water use and other utilities within Skull Valley are expected to be small. The addition of 13 new households and 28 new residents is not expected to strain existing utilities within the impact area, since most if not all of those inmovers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley).

Solid and sanitary waste. Impacts to solid waste management are expected to be small to non-existent. Clearing of the right-of-way for the ITF parcel would involve the removal and disposal of vegetation within the right-of-way. Any woody vegetation would be shredded and scattered in place. Sanitary wastes would be managed with conventional systems, such as portable toilets.

Transportation and traffic. Impacts of the construction of the ITF on the local transportation system are expected to be small. Construction of the ITF and associated access road and rail siding would require the movement of excavated soils and ballast and sub-ballast. The amount of ballast, sub-ballast, and other rail bed construction materials needed for the rail siding amounts to approximately 14,420 m^3 (18,850 yd^3), and approximately 1,900 m^3 (2,500 yd^3) of asphalt paving would also be needed (PFS/RAI2 1999). The ballast and sub-ballast (composed of crushed gravel or rock) would be obtained from one or more existing commercial gravel pits in the area. Assuming a per-truck capacity of approximately 15.3 m^3 (20 yd^3) (PFS/ER 2000) for movement of the ballast and sub-ballast, a total of approximately 1,885 truck trips would be required to transport the ballast and sub-ballast (a truck trip, or vehicle trip, is defined as a single one-directional vehicle movement; hence, a vehicle arriving and departing the point of delivery constitutes two vehicle trips). Assuming that these 1,885 trips are made within a three month period of the 12-month construction period, there would be approximately 31 truck trips per day (15 to 16 trucks going each way on I-80 to and from the point of ballast and sub-ballast delivery) or approximately three vehicles per hour.

In addition to ballast and sub-ballast deliveries, a peak construction work force of 35 workers would commute to and from the construction site in individual passenger vehicles and light trucks on a daily basis. These workers will account for an increase of 70 vehicle trips per day on Interstate 80 during construction of the ITF and associated access road and rail siding. All together, construction of the ITF and associated access road and rail siding would result in an increase of approximately 100 vehicle trips per day on Interstate 80. This increase amounts to approximately 1.2 percent greater use of the interstate than had been experienced in 1995 (see Section 3.5.2.4). This additional traffic volume would have a negligible effect on the level of service on Interstate 80 but could have some adverse effects on the movement of traffic onto and off of the interstate. This adverse effect on feeders to and from Interstate 80 also results from delivery trucks moving at a slower rate of speed before entering and after leaving the interstate than other traffic, requiring other traffic to reduce travel speed.

Land use. Construction of the ITF would have small impacts on current land use. The site for the ITF and associated access road and rail siding is located on previously disturbed, but currently unused public land, administered by the BLM. The site is adjacent to the Union Pacific main line.

Economic structure. Because the construction workforce (direct and indirect) would be 35 people and the construction period would be less than one year, the effect of the proposed PFSF on the economic structure of the local area would be small but favorable. The unemployment rate in Tooele County would have the potential to fall slightly in the impact area due to the hiring of current residents and the in-moving of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by tribal members would constitute a positive impact on the tribal economy.

5.5.2 Impacts During Operations

Direct impacts to socioeconomic and community resources are primarily associated with any physical changes to those resources that would result from operation of either of the two local transportation options. Indirect impacts are primarily associated with workers and families who might move into the area and place additional demands on existing resources. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

5.5.2.1 New Rail Line from Skunk Ridge

Direct impacts of the proposed rail line for the movement of SNF from Skunk Ridge to the proposed PFSF would have small to moderate impacts to socioeconomic and community resources. This is because the change to the physical environment required for operation of the rail line impinges directly on livestock grazing resources (direct impacts to recreational resources and opportunities are addressed in Section 5.8.3). The increased risk of fire associated with use of the proposed rail line could also have a corresponding effect on the availability of livestock and wildlife forage in the event of a spark-induced fire (see Section 5.8.4). However, revegetated areas of the rail line may function as a green strip to help prevent the spread of fire (see Section 5.4.2.1). Such a fire barrier would minimize the potential impact from any spark-induced fires.

The socioeconomic and community resource impacts from operation of the rail line from Skunk Ridge to the proposed facility are a function of the anticipated traffic on this new line compared to the existing traffic on the main Union Pacific line. PFS plans no more than one or two round trips per week using the new rail line, and this volume of traffic is sufficiently small as not to result in any significant impacts (including impacts to grazing or recreational activities).

Indirect impacts are expected to be small, since the work force required to operate the proposed rail line, which is incorporated in the work force for operation of the proposed facility itself (see Section 4.5.2), is very small. Since the indirect impacts to socioeconomic and community resources associated with the PSFS workforce itself were small, they would likewise be small for operation of the proposed rail line.

5.5.2.2 New ITF Near Timple

Direct impacts of using the ITF/heavy haul local transportation option are also expected to be small, although the use of Skull Valley Road to transport fabricated steel liners for the storage casks and 2 to 4 round trip shipments, per week, of SNF in shipping casks to the proposed project site, could result in possible delays for traffic along Skull Valley Road (see Section 4.5.2).

The socioeconomic and community resource impacts of using an ITF and transporting the SNF in canisters in heavy-haul tractor/trailers on Skull Valley Road to the proposed facility are a function of the amount of heavy-haul traffic on Skull Valley Road. PFS plans two to four round trips per week for the heavy haul transportation of casks along the 42-km (26-mile) segment of Skull Valley Road from the proposed ITF to the proposed PFSF (PFS/ER 2000). The heavy haul tractor/trailers would move at a slow rate of speed [32 km/h (20 mph)], requiring other traffic to reduce travel speed or make additional passing maneuvers (PFS/ER 2000). Utilization of heavy haul equipment for cask transportation would result in the transportation vehicle passing within approximately 15 m (50 ft) of two residences located along Skull Valley Road (PFS/ER 2000). In addition, there is some potential for inconveniencing regular traffic along Skull Valley Road as a result of these movements, but the small number of round trips per week should result in no significant impacts.

Indirect impacts are also expected to be small, since the workforce required to operate the ITF, with the exception of the heavy haul truck drivers, are part of the work force for operation of the proposed facility itself (see Section 4.5.2). Since the indirect impacts to socioeconomic and community resources associated with the PFSF workforce itself have been determined to be small (see Section 4.5.2), they would likewise be small for operation of the ITF and heavy haul transportation option.

5.5.3 Impacts at the Alternative Site B

The alternative location (i.e., Site B) in Skull Valley for the proposed facility lies just south of the preferred site. Because Site B is very close to the preferred site, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction or operation for either of the local transportation options.

5.5.4 Mitigation Measures

Since the direct and indirect impacts of construction and operations for both local transportation options to socioeconomic and community resources are considered small to moderate, few mitigation measures are required.

The only socioeconomic and community resources that are potentially adversely affected by construction and operation of the proposed transportation facilities are (1) livestock, in that there could be disruptions to livestock management, including livestock movement across the tracks both within and between pastures for the new rail line option and (2) transportation, in that there could be increased traffic along Interstate 80 and Skull Valley Road for the ITF/heavy-haul option. Mitigations for these impacts are discussed in the following paragraphs.

The potential for impacts to livestock management arises due to conflicts between existing use of the land and its water resources and the construction and use of the proposed rail line. Consideration should be given to the avoidance or amelioration of adverse impacts to grazing by taking several actions, including the repair and maintenance of Pasture and Allotment division fences crossed by the proposed rail line in such a manner that livestock would not be able to cross from one area to the other (e.g., cattle guards); cooperating with the BLM and permitees to develop watering facilities east of the proposed rail route for the purposes of providing watering facilities for livestock and for use for fire suppression; providing livestock-secure fenceline crossings; installing gates at crossings of unimproved roads; and developing fire mitigation and detection plans in cooperation with BLM. The cooperating agencies recommend that PFS be required to develop a plan to minimize impacts to livestock grazing activities during construction and operation (see Section 9.4.2).

The potential for traffic impacts arises due to the anticipated increase in the use of Skull Valley Road by construction and operation workers, as well as the possible use of heavy-haul vehicles under the ITF transportation option. The potential for adverse impacts to traffic during operations on Skull Valley Road would be greatest during the movement of fabricated steel liners and SNF to the proposed facility. The magnitude of such impacts are discussed above. Consideration should be given to the avoidance or amelioration of adverse transportation impacts by appropriate scheduling of facility-related traffic.

Degradation of the unimproved roads, adjacent to the proposed rail line corridor, could occur if they are used frequently by PFS or used to transport heavy materials. If PFS determines that it needs to use the unimproved roads, PFS should minimize the impacts to these roads by covering them with gravel, or occasionally blading the roads and using a coating such as magnesium-chloride. The cooperating agencies recommend that PFS be required to develop a plan to minimize impacts to the unimproved roads (see Section 9.4.2). The plan should include one or more of the methods described above.

5.6 Cultural Resources

5.6.1 Construction Impacts

5.6.1.1 New Rail Line from Skunk Ridge

As discussed below, impacts are expected to be small to moderate. Under the proposed action, development of the proposed Skunk Ridge transportation route would involve construction of a new rail siding at Skunk Ridge and construction of a rail line southward through the western portion of Skull Valley to Site A on the Reservation. An intensive field cultural resources survey of the proposed rail alignment has documented the presence of two historic period properties within the corridor (Newsome 1999). One of these consists of a rock alignment and cairn (42TO1187) which is believed to be historic in age but which is without artifacts. Therefore, this site was not fully evaluated for NRHP eligibility. The centerline of the transportation corridor passes just west of the primary features at this site.

The other site is a fairly well preserved segment of the historic emigrant trail known as the "Hastings Cutoff" (of the California National Historic Trail) (42TO709). Because of its high degree of physical integrity and association with significant historical events and people, the Hastings Cutoff segment is considered to be eligible for listing on the NRHP. Because the proposed transportation corridor crosses the Hastings Cutoff segment at essentially a right angle, construction of the railroad would directly impact only a short segment of the trail. In addition to the physical integrity of the trail in this area, the Skull Valley setting is one without extensive development of modern intrusions. Therefore, the general environmental setting retains a visual impression of the original landscape during the westward migration of the mid-1800s. As a consequence, construction of the Skunk Ridge rail line will be an intrusion on both the cultural landscape aspect and physical vestiges of this historic episode.

In addition to the two historic properties discussed above, the field survey recorded four instances of isolated artifacts in the Skunk Ridge rail corridor, three of which are historic in origin. None of the isolated finds is considered eligible for listing on the NRHP.

Historic properties known to be present at the proposed Skunk Ridge rail siding include abandoned segments of the old U.S. Highway 40, a possible segment of the older Victory/Lincoln Highway, a historic telephone line, and the historic Union Pacific Railroad with associated features including a possible historic Western Union telegraph line. None of these resources has been evaluated, though some appear to suffer from poor integrity. In the southern part of the rail corridor, two abandoned 19th century trails may be present. These are the Road to Sulphur Spring and the Road to Deep Creek (GLO Map 1871). Neither of these resources has been evaluated, and additional work should be performed to identify and evaluate these resources.

Construction of the railroad along the western edge of Skull Valley would directly impact one cultural resource (i.e., Hasting Cutoff) that is considered eligible for listing on the NRHP, and may impact another that has not been fully evaluated. Construction of the rail siding at Skunk Ridge could potentially impact at least three cultural resources (i.e., historic telephone line, historic Union Pacific Railroad, and the historic U.S. 40) that have not yet been evaluated. Because of this, the potential for impacts along this corridor is expected to be moderate but could be mitigated prior to construction (see Section 5.6.5). In addition, the potential to find buried cultural resources exists. PFS should implement measures to identify and evaluate any cultural resources encountered during construction to determine their significance.

5.6.1.2 New ITF Near Timpie

As discussed below, impacts of the ITF are expected to be small. Use of the existing Skull Valley Road for heavy-haul transportation would involve construction of a new ITF near Timpie and use of the existing Skull Valley Road. Historic features present in the vicinity of the proposed ITF include a historic telephone line and the historic Union Pacific Railroad with associated features. None of these resources has yet been evaluated. An archeological survey of this location revealed no archeological resources within the location itself (Newsome 1999). Therefore, the potential for impacts to cultural resources at the ITF location is considered to be small.

As discussed in Section 3.6, there are several known prehistoric and historic properties in the vicinity, including the historic Timpie Railroad Siding, active and abandoned historic ranches, the former Iosepa town site, historic trails and the early Lincoln Highway route, and several recorded archaeological sites. The eastern side of the valley also includes known, but unrecorded, historic period tribal winter village sites, and many other important named places on the landscape. However, use of the Skull Valley Road with no improvements would not impact known cultural resources along that corridor. Therefore, the heavy-haul alternative from Timpie to the preferred site on the Reservation would have a small potential for impacts to cultural resources.

5.6.2 Impacts During Operations

Normal operational activities to transport SNF to the PFSF on the Reservation are not expected to have potential for impacts to cultural resources since no additional ground disturbance will occur. Therefore, the overall potential for impacts is expected to be small.

5.6.3 Impacts at the Alternative Site B

The potential for transportation related impacts to cultural resources should the proposed PFSF be constructed at Alternative Site B on the Reservation are essentially the same as for Site A, and are expected to be small to moderate. Impacts from the ITF are expected to be small.

5.6.4 Native American Cultural Resources

Based on responses to consultation letters sent by the BLM to potentially affected tribes (Appendix B) and comments received during public scoping meetings, there are no identified traditional cultural properties or other traditional cultural resources known to exist along the Skunk Ridge rail corridor or at the ITF location. The former Native Hawaiian townsite of Iosepa and the currently protected associated cemetery, lie adjacent to the Skull Valley Road, but would not be affected by construction or heavy haul traffic since the road itself would not be altered. Based on the known information regarding the presence of traditional cultural places along the transportation features, the potential impacts to such resources are considered to be small.

5.6.5 Mitigation Measures

As part of the consultation process required by Section 106 of the NHPA, a memorandum of agreement (MOA) would be prepared that identifies the mitigation measures to be implemented by PFS. PFS has prepared a draft treatment plan (Newsome and Schroedl 1999) to mitigate project-related impacts to the Hastings Cutoff trail segment. The plan proposes photographic and historical documentation of the affected trail segment extending across Skull Valley. This plan is being revised to include detailed description of the trail segment's characteristics and condition, and digital mapping. Mitigation of impacts to historic resources at the proposed Skunk Ridge rail siding would be required if these features were found to be eligible for listing on the NRHP. Documentation required as part of the evaluation process should constitute adequate mitigation of impacts to these features. These measures are being proposed in the revisions of the treatment plan. The treatment plan will be further revised as needed to reflect the decisions reached during the consultation process. The cooperating agencies recommend that PFS be required to develop a plan to ensure all mitigation measures specified by the MOA are completed (see Section 9.4.2).

Mitigation of impacts to historic resources at the ITF location near Timpie could be required if adjacent historic features (e.g., telegraph lines or other transportation routes) were found to be eligible for listing under the NHPA. Documentation required as part of the evaluation process should constitute adequate mitigation of impacts to these features. These measures are being proposed in the revisions of the treatment plan.

PFS should develop a plan to identify and evaluate any cultural resources encountered during construction of the rail line or ITF. The plan should include training of personnel to identify cultural resources and access to qualified individuals that can access the significance of the resource. The cooperating agencies recommend that PFS be required to implement these mitigation measures (see Section 9.4.2).

5.7 Human Health Impacts of SNF Transportation

This section discusses the radiological and non-radiological human health impacts associated with transportation of SNF from nuclear power plants to the proposed PFSF in Skull Valley. For cross-country transportation to the proposed PFSF, only shipments by rail are analyzed because PFS plans to receive only rail casks under its NRC license. However, also considered are rail shipments that might involve a short highway (or barge) segment to reach a rail line, for reactor sites that do not have direct rail access, or if an ITF is constructed in Skull Valley. This DEIS also documents an evaluation of impacts of transporting SNF from the PFSF to a permanent repository. A DEIS prepared by DOE (DOE 1999) addresses in detail the national and regional transportation impacts of building and operating a permanent repository at Yucca Mountain, Nevada. Because Congress has directed DOE to study only Yucca Mountain for the proposed repository, this analysis includes an evaluation of transporting by rail all SNF that would be stored at the proposed PFSF to the Utah-Nevada border on its way to the permanent repository.

The non-radiological human health impacts discussed in this section include (1) the occupational hazards from construction and operation of the proposed rail line and an ITF; (2) the safety impacts associated with increased rail traffic, which include an analysis of the increase in traffic accidents (e.g., derailments, crossing accidents) attributable to the additional rail traffic; and (3) human health effects due to vehicle exhaust emissions along the rail lines during transport of SNF to the proposed PFSF. The potential non-radiological impacts would also include socioeconomic impacts (see Section 5.5) and environmental justice impacts (see Section 6.2).

5.7.1 Non-Radiological Impacts

5.7.1.1 Potential Workers Injuries During Construction and Operation of Transportation Facilities

Potential health impacts to workers during construction and operation of transportation facilities in Skull Valley would be limited to the normal hazards associated with the construction and operational activities of these facilities (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). The impacts of these hazards include fatal and nonfatal occupational injuries that may result from overexertion, falls, or being struck by equipment (NSC 1994). Because there are no unusual situations anticipated to make the construction-related activities more hazardous than normal, there would be only small impacts to worker health and safety due to fatal and nonfatal occupational construction-related activities. As discussed below, the staff finds the non-radiological health effects to be small.

During the construction and operation of either the proposed rail line or the ITF, non-radiological pollutants of concern to worker and public health would include the criteria pollutants and dust (both of which are addressed in Section 5.3). With adequate control measures, such as treating areas with water or chemical surfactants for dust suppression, etc., the impact on worker and public health would be expected to be small. There are no other potential non-radiological health impacts to the public from the proposed project, since members of the general public would not be allowed on the construction sites. Therefore, only fatal and nonfatal occupational injuries warrant any further analysis. These types of injuries are discussed below.

In order to estimate the number of potential fatal and nonfatal occupational injuries due to the construction, normal operations, and decommissioning of transportation facilities in Skull Valley, data on fatal occupational injuries per 100,000 workers per year and data on nonfatal occupational injuries per 100 full-time workers per year over the time period of 1994 to 1998 were collected from the Bureau of Labor Statistics (BLS) Internet Web site (http://stats.bls.gov/oshhcfoil.htm) and the Occupational Safety and Health Administration (OSHA) Internet Web site (http://www.osha.gov/oshstats/work.html). Visual inspection indicated no obvious time trend in the data for this period. The arithmetic mean and standard deviation for the fatal and nonfatal occupational injury rates were calculated. These BLS and OSHA data for the construction, trucking and railroad industries were used to estimate the potential fatal and nonfatal occupational injuries for the construction and normal operations of the proposed transportation facilities in Skull Valley. Table 5.4 presents the probability of fatal and nonfatal occupational injuries during the construction and normal operations of both the proposed rail line and the ITF.

Table 5.4. Estimated probabilities of fatal and nonfatal occupational injuries for the construction and normal operations for the proposed rail line and the ITF

Activity	Duration of activity	Probability of fatal injuries	Probability of nonfatal injuries
Construction			
Rail line	14 months	0.021	0.15
ITF	1 year	0.005	0.035
Operations			
Rail line	40 years[a]	0.0023	0.03
ITF	40 years[a]	0.034	0.18

[a]40 years includes 20 years of operations to load the storage area and 20 years of operations to empty the storage area.

Source: Bureau of Labor Statistics (BLS) Internet Web site (http://stats.bls.gov/oshhcfoil.htm) and the Occupational Safety and Health Administration (OSHA) Internet Web site (http://www.osha.gov/oshstats/work.html).

Potential worker injuries during construction. The transportation facilities facility would be subject to OSHA'S General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). Construction risks can be minimized by adherence to the procedures and policies required by OSHA and the state of Utah. These standards establish practices, procedures, exposure limits, and equipment specifications to preserve employee health and safety.

In addition OSHA inspections can also be employed in an effort to reduce the frequency of accidents and further ensure worker safety.

Potential fatalities. The construction of the proposed rail line would require a peak work force of 125 workers and would be completed in 14 months. Based on the aforementioned BLS statistics for construction worker fatal occupational injuries (i.e., fatalities), the probability of a fatality over the construction period is estimated to be 0.021. This estimate is conservative, because it assumes that a work force of 125 workers (the estimated peak workforce) would be employed for the entire construction period.

The construction of the ITF would require a peak workforce of 35 workers and would be completed in less than one year. The probability of a fatality during the construction of the ITF was estimated to be 0.005. This estimate is also conservative, because it assumes a force of 35 workers (the estimated peak workforce) would be employed for the entire construction period.

Potential nonfatal occupational injuries. Based on BLS statistics for construction worker nonfatal occupational injuries, the probability of a nonfatal injury over the 14-month construction period of the rail line is estimated to be 0.15. Based on BLS statistics for construction worker nonfatal occupational injuries, the probability of a nonfatal injury over the 1-year construction period for the ITF is estimated to be 0.035.

Potential worker injuries during operations. Following the construction of either of the two transportation facilities, SNF would be transported from the northern portions of Skull Valley to the proposed PFSF. Worker injuries may occur during these local transportation activities.

Potential fatalities. Operation of the proposed rail line would involve two employees operating a locomotive to move SNF to the proposed PFSF. These activities would occur over a 40-year period, including the receiving of SNF shipments and the shipment of SNF away from Skull Valley to a permanent repository. Based on BLS statistics of the railroad transportation industry, the probability of a fatality during the 40-year period is estimated to be 0.0023.

Operation of the ITF would require a four-man crew to move SNF on Skull Valley road. These activities would also occur over a 40-year period. Based on BLS statistics for the trucking and warehousing industry, the probability of a fatality during the 40-year period is estimated to be 0.034.

Potential nonfatal occupational injuries. An analysis of the railroad transportation industry's statistics indicates that the probability of a nonfatal injury on the proposed rail line during normal operations over 40 years would be 0.03.

For operation of the ITF and the heavy-haul vehicles down Skull Valley Road, the probability of a nonfatal injury expected during the 40-year operational period would be 0.18. This includes the risks of activities involving the transfer of SNF casks from railcar to truck at the ITF as well as transportation of SNF by heavy-haul vehicles on Skull Valley Road.

5.7.1.2 Rail Traffic Accidents

The proposed PFSF will have the capacity to store 4,000 casks. PFS has indicated that on average there would be 50 incoming shipments per year carrying four spent fuel casks each. On the basis of this information, the shipping campaign would last 20 years. The casks would subsequently be shipped from Skull Valley to a national repository for final disposal, and the PFSF could be emptied in 10 years by placing four casks on each train and making 100 shipments per year. Assuming 10 years of on-site storage with no incoming or outgoing SNF shipments, it can be inferred that the PFSF would then be operational for a total of 40 years.

The average distance by rail to the proposed PFSF from nuclear power reactors east of the proposed site in Skull Valley is 3,410 km (2,119 miles). If each SNF train travels an average of 3,410 km (2,119 miles) and brings four railcars (each with a single SNF shipping cask) into the proposed PFSF, the total distance covered by the trains for the entire campaign for shipping SNF to the facility will equal 13.6×10^6 railcar-km (8.5×10^6 railcar-miles). For trains eventually transferring casks away from the proposed PFSF to the permanent repository, the rail distance is estimated to be 950 km (590 miles). Thus, the total distance covered by trains in transferring all casks to the national repository would be 3.8×10^6 railcar-km (2.4×10^6 railcar-miles). Therefore, the total distance associated with the entire lifetime set of operations (i.e., both receiving SNF at and shipping SNF from the proposed PFSF) would be 17.4×10^6 railcar-km (10.8×10^6 railcar-miles). A round-trip calculation is included in this analysis to provide an upper bound on the number of railcar-km. The round-trip distances for the lifetime set of operations would then be 34.8×10^6 railcar-km (21.6×10^6 railcar-miles).

Vehicle-related accident risks involve accidents that result in injuries and fatalities that are not related to the cargo being shipped. Saricks and Kvitek (1994) examined these risks and found—based on national average accident statistics—that, considering all injuries and fatalities associated with regular trains, the rates were 4.26×10^{-8} injuries per railcar-km and 2.27×10^{-8} fatalities per railcar-km. Thus, the risk to the public from the shipping campaigns needed to get SNF to Skull Valley and then move it to the national repository would be:

$$(4.26 \times 10^{-8} \text{ injuries/railcar-km}) \cdot (34.8 \times 10^6 \text{ railcar-km}) = 1.48 \text{ injuries, and}$$
$$(2.27 \times 10^{-8} \text{ fatalities/railcar-km}) \cdot (34.8 \times 10^6 \text{ railcar-km}) = 0.78 \text{ fatalities}$$

over the 40 year assumed lifetime of the proposed PFSF. Because these are very small risks over the assumed 40-year life of the proposed facility, the staff finds these potential impacts to be small.

Saricks and Kvitek (1994) also noted that dedicated trains—such as would be used to transport spent nuclear fuel—spend much less time in rail yards than do regular trains, since dedicated trains do not undergo classification; thus, it appears that the injuries and fatalities based on national averages are not as relevant for dedicated trains as they are for regular trains. Should the large portion of casualties which occur in rail yards be excluded from the national averages, the injury rate would decrease by a factor of almost 7 and the fatalities would decrease by a factor of about 36.

5.7.1.3 Latent Health Effects

The cross-country shipment of SNF could involve non-radiological health risks associated with the generation of air pollutants by the vehicles during shipment, independent of the nature of the type of cargo being shipped. The health endpoint assessed under routine transport conditions is the risk of excess (additional) latent mortality caused by inhalation of vehicular exhaust emissions. The risk factor for latent mortality from pollutant inhalation, as generated by Rao et al. (1982), is 1.3×10^{-7} latent fatalities per train-km for rail transport in urban areas. This risk factor is based on regression analyses of the effect of sulfur dioxide and particulate releases from diesel exhaust on mortality. Vehicle-related risks from routine transportation are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar risk factors are not available for rural and suburban areas.

If it is assumed that the total population along the rail routes is "urban," then the total indirect risk to the public from the non-radiological impacts of SNF transportation can be computed as:

$$(1.3 \times 10^{-7} \text{ latent fatalities/train-km}) \bullet (34.8 \times 10^{6} \text{ railcar-km}) \div (4 \text{ railcars per train}) = 1.14 \text{ latent fatalities.}$$

Because this is a very small risk over the assumed 40-year lifetime of the proposed facility, the staff finds this impact to be small.

5.7.2 Radiological Impacts

The radiological impacts of incident free (SNF shipments that do not involve accidents) SNF transport would include exposure of the public and the workers to ionizing radiation, thereby resulting in members of the general public and the transportation workers (e.g., the train crew) receiving a radiation dose. The impacts from potential accidents could result in additional radiological exposure. The radiological impacts of spent fuel transportation presented in this section include estimates of dose from incident-free transportation and from potential transportation accidents.

Incident-free risks of transporting SNF are dependent on the characteristics of the shipping casks (e.g., dimensions and surface dose rates), the number and length of shipments, the vehicle speed, and the population densities along the travel routes. Accident risks are dependent on the severity and likelihood of potential accidents, and the amount of radioactive material that could be released as a result of an accident. During incident-free transportation, the crew and some people along the transportation routes (for example, people near the rail lines or traveling on them) can receive radiation exposure because a small amount of radiation, within regulatory limits, emanates through the walls of loaded spent fuel shipping casks. A severe transportation accident could create forces large enough to damage a cask, causing a release and dispersal of radioactive material or an increase in the amount of radiation emanating through the cask walls through loss of cask shielding. In looking at the impacts of transportation accidents, NRC considers both the likelihood of an accident severe enough to damage a cask and the radiological consequences of such an accident.

In this DEIS computer analyses were used to assess both the incident-free and accident-related radiological impacts for cross-country transportation (i.e., from reactor sites to PFSF) and pursuant to 10 CFR 72.108 regional transportation. The regional transportation analysis assesses the possible radiological impacts along the five routes within the State of Utah that could be used to transport SNF to the proposed PFSF. The results of the regional analysis are summarized in Section 5.7.3 and discussed in detail in Appendix D. The analyses consider both local transportation alternatives discussed in Section 2.2.4. To assess the significance of the transportation activities related to the proposed action, the results and findings are compared to those of NUREG-0170, *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes*, December 1977. All SNF shipments to the proposed PFSF would be from commercial nuclear power plants and, therefore, would be subject to NRC and DOT transportation regulations.

The staff finds that the radiological impacts from the transport of SNF to the proposed PFSF are small. A summary of the staff's evaluation and results are presented below.

5.7.2.1 Summary of Findings

This section summarizes the results of the cross-country transportation analyses performed for this DEIS. Details of the analyses that were performed are presented in later sections. Results are presented in comparison to those of NUREG-0170. NUREG-0170 is used by NRC and the DOT as a basis for the adequacy of the regulations governing radioactive materials transportation (10 CFR Part 71 and various parts of 49 CFR). The annual radiological impacts of transportation calculated in this study and NUREG-0170 are summarized in Tables 5.5, 5.6, and 5.7. It should be noted that comparing the LCF predictions from NUREG-0170 and this analysis are not straightforward because different models were used to estimate the values. However, the results from both studies show that the estimated LCFs associated with the transport of SNF would be small.

Table 5.5. Annual incident-free SNF transportation doses[a]

	Number of shipments per year	Incident-free [person-Sv (person-rem)]	
		Rail	ITF
Reactor site to proposed PFSF	200	0.104 (10.4)	0.23 (23)
Proposed PFSF to final repository[b]		0.00298 (0.298)	0.069 (6.9)
NUREG-0170	652	2.98 (298)	—

[a]Includes doses to the public, transportation workers, and workers handling fuel at the ITF.
[b]Evaluates transportation impacts from the proposed PFSF to the Utah-Nevada border.

Table 5.6. Annual expected latent cancer fatalities (LCFs) for incident-free SNF transport

	Number of shipments per year	Incident-free risk (LCF)	
		Rail	Intermodal
Proposed PFSF	200	5.08×10^{-3}	1.02×10^{-2}
NUREG-0170[a]	652	3.60×10^{-2}	—

[a]Based on the estimates in NUREG-0170 that 1 percent of the LCFs from transportation of all radioactive material would occur from rail shipment of SNF.

Note: Includes doses to the public, transportation workers, and workers handling fuel at the ITF.

Table 5.7. Annual expected latent cancer fatalities (LCFs) for potential accident risk to the public during SNF transport

	Number of shipments per year	Accident risk (LCF)	
		Rail	Intermodal
Proposed PFSF	200	2.12×10^{-3}	2.12×10^{-3}
NUREG-0170[a]	652	8.00×10^{-1}	—

[a]Based on the estimates in NUREG-0170 that 1 percent of the LCFs from transportation of all radioactive material would occur from rail shipment of SNF.

Based upon the assessments and results performed for this DEIS, the NRC concludes that the radiological doses from transportation of SNF, by rail only or via the ITF, from existing reactor sites to the proposed PFSF and from PFSF to a permanent repository are small. Further, the results indicate that the estimated doses resulting from shipments of SNF to the proposed PFSF are a small fraction of the doses reported in NUREG-0170.

5.7.2.2 Approach to Analysis

The approach of this analysis is to estimate the magnitude of the annual radiological doses resulting from transport of SNF to the proposed PFSF. To complete the analysis, the potential radiological impacts from incident-free transport and potential transportation accidents associated with shipping SNF to and from the proposed PFSF were conservatively estimated. Those results were then examined to determine if the impacts of the transportation to and from the proposed PFSF were consistent with the results of NUREG-0170. See Section D.2 in Appendix D.2 of this DEIS for a brief discussion of NUREG-0170.

In this analysis, the RADTRAN4 computer code (Neuhauser 1992) was used to model both the incident-free radiological exposure and the consequences of radiological releases due to severe accidents. The route and population density numbers used by RADTRAN4 were generated by the INTERLINE computer code to estimate the impacts of shipping SNF to and from the proposed PFSF. Future changes in the population density were considered in estimating the impacts from shipping SNF to and from the proposed PFSF. Appendix C discusses the INTERLINE route analyses and Appendix D discusses the RADTRAN4 analyses. The human health risks of the radiological exposures are expressed as LCF values. (See Section 3.7 for the definition of LCF.) Radiation-dose-to-cancer-risk factors from NAS (1990) [i.e., 5×10^{-6} LCF/Sv (5×10^{-4} LCF/rem) for the general public and 4×10^{-6} LCF/Sv (4×10^{-4} LCF/rem) for workers] were used to estimate the LCF values.

As discussed below, this analysis used inputs that conservatively estimate the impacts associated with the number of SNF transports that might occur if the proposed PFSF is licensed and begins operations. Many "conservative" assumptions were used in this DEIS assessment, as set forth below, to provide reasonable assurance that the impacts of the actual activity, if it occurs, are overestimated.

In the RADTRAN4 computations used to support this DEIS, the accident categories, event trees, and release fractions developed in NUREG/CR-4829, *Shipping Container Response to Severe Highway and Railway Accident Conditions*, February 1987, (frequently referred to as the Modal Study) were used. The Modal Study was conducted by Lawrence Livermore National Laboratory in support of NRC's efforts to further examine the level of safety provided by its regulations with respect to accident conditions. The Modal Study also examined transport cask response to accidents by using computer modeling of generic cask responses to accident forces. The Modal Study results indicated that annual SNF shipment risks were about one-third those estimated in NUREG-0170. The NRC staff concluded from the Modal Study that NUREG-0170 clearly bounded spent fuel shipment risks.

5.7.2.3 Assumptions for this Analysis as Compared to NUREG-0170

Route and shipment parameters. Table 5.8 describes attributes of the generic routes used in NUREG-0170 and the route used in this DEIS. The radiological impacts for both incident-free transportation and for possible transportation accidents are sensitive to these variables, particularly route length, so choosing a route that tends to maximize them is a conservative approach. The majority of the fuel (over 90 percent) would arrive at the proposed PFSF from eastern reactor sites. In order to develop an estimate of the total risk of cross-country shipments of SNF to the proposed PFSF, NRC has taken a very conservative assumption that all 40,000 MTU of SNF would be shipped to the PFSF from the Maine Yankee plant, 16 km (10 miles) north of Bath, Maine. The route selected for this analysis is 4,476 km (2,781 miles) in length (see Figure 5.1) and passes through large population centers of Schenectady, New York; Buffalo, New York; Cleveland, Ohio; Toledo, Ohio; Gary, Indiana; Chicago, Illinois; Ogden, Utah; and Salt Lake City, Utah. The route is described in detail in Appendix C. Using this cross-country route in the transportation analysis results in a conservative estimate of the national transportation impacts of the proposed action. As compared to NUREG-0170, this route is much longer and assumes a much larger number of people are exposed to each SNF shipment. The annual number of exposures (as measured by the number of casks times the population along the route) are not significantly different (181,088,436 for NUREG-0170 and 224,647,600 for this study) because NUREG-0170 assumed 652 cask shipments as opposed to only 200 cask shipments, which is the annual maximum for PFS.

If the proposed rail line from the Union Pacific mainline at Skunk Ridge were not constructed to the proposed PFSF, an ITF would be constructed near the Timpie siding. Heavy-haul vehicles would use Skull Valley Road to move the SNF casks from the ITF to the proposed PFSF site. The rail route from Maine Yankee to the ITF would be nearly identical to the route described for all rail shipment between Maine Yankee and the proposed PFSF, except the route would terminate at the Timpie siding. This route is 4,389 km (2,727 miles) long. The heavy-haul route from the proposed ITF near Timpie to the proposed PFSF site is 42 km (26 miles) long.

An additional assessment was performed for shipments from the proposed PFSF to a permanent repository at Yucca Mountain, Nevada. Because Congress has directed DOE to study only Yucca Mountain as the potential repository, this analysis uses an assumption that all SNF would be transported from the proposed PFSF to the Utah-Nevada border on the way to the repository. Future population estimates were used in this assessment. The assumption was that shipments would leave the PFSF via rail and travel through Black Rock, Utah to the Nevada border (see Figure 5.2). This route was selected because it is the most direct and therefore the most likely route to be used

Table 5.8. Spent fuel route data as used in this analysis and in NUREG-0170[a]

Parameter	Maine Yankee to PFSF: Rail to PFSF	Maine Yankee to PFSF: Rail to ITF[b]	NUREG-0170 rail route
Route length (km)	4,476	4,431	1,210
Urban fraction	0.043	0.044	0.05
Suburban fraction	0.23	0.24	0.05
Rural fraction	0.73	0.72	0.9
Population densities (people/km^2)			
Urban	2,552	2,552	3,861
Suburban	335	335	719
Rural	9	9	6
Population assumed exposed per shipment (number of people)			
1990 population	864,029		NA
Estimated population in 2020[c]	1,123,238		NA
NUREG-0170 (1985)	NA		277,743
Shipments per year (single cask)			
Maine Yankee to PFSF	50[d]		NA
NUREG-0170	NA		652

[a]To convert kilometers to miles, multiply by 0.62. To convert people per square kilometer to people per square mile, multiply by 2.59.

[b]The 42 km between the ITF and the PFSF is all rural with a density of 1.3 people per km^2.

[c]Calculated as a 30-percent increase in the 1990 population..

[d]At four casks per shipment.

to ship SNF from the PFSF to Yucca Mountain. Shipment plans within Nevada are subject to decisions of the DOE that have not yet been made (for example, the locations of intermodal transfer points or new direct-access rail lines to Yucca Mountain). DOE is analyzing the national and Nevada-regional transportation impacts of building and operating a repository at Yucca Mountain (DOE DEIS 1999).

Future population growth. All RADTRAN calculations were carried out using population density information from the U.S. Census Bureau for the year 1990, the latest year for which detailed census information exists. That information provides not only data on the number of people all over the United States, but also identifies where they live. Since that time, the U.S. population has grown, and this growth is expected to continue. Currently the U.S. Census Bureau has projected growth in the country to the year 2100, but obviously data are not available as to where the new people will live. To account for the population increase on cross-country routes to the proposed PFSF, the population exposures generated by RADTRAN have been multiplied by the ratio of the population projected for the year 2020 to the actual population in the year 1990. Information from the U.S. Census Bureau indicates that with an average growth rate, the population of the United States will reach 325 million in the year 2020. Since the U.S. population was 250 million in 1990, the projected

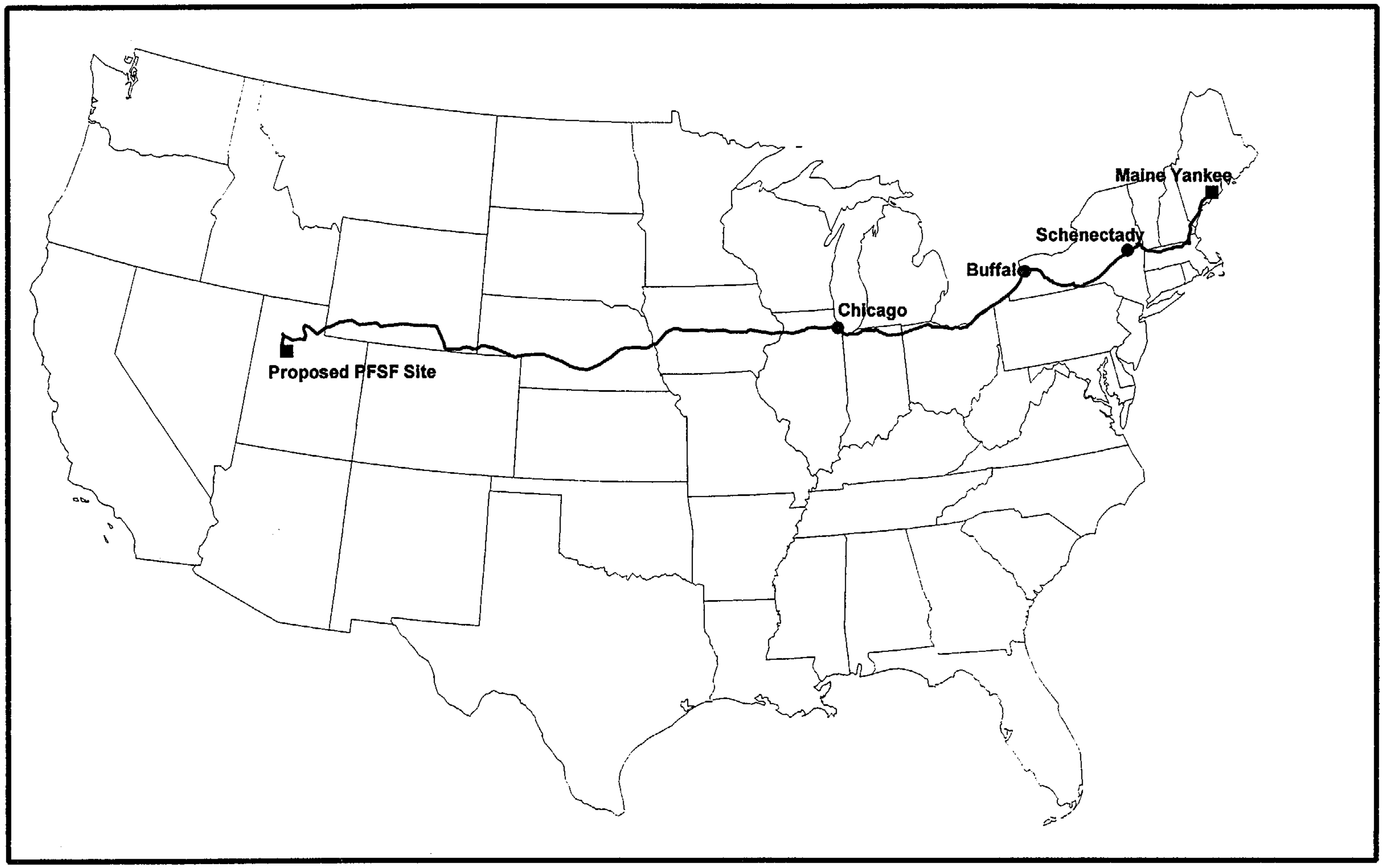


Figure 5.1. Rail route from the Maine Yankee nuclear power plant to the proposed PFSF in Skull Valley, Utah.

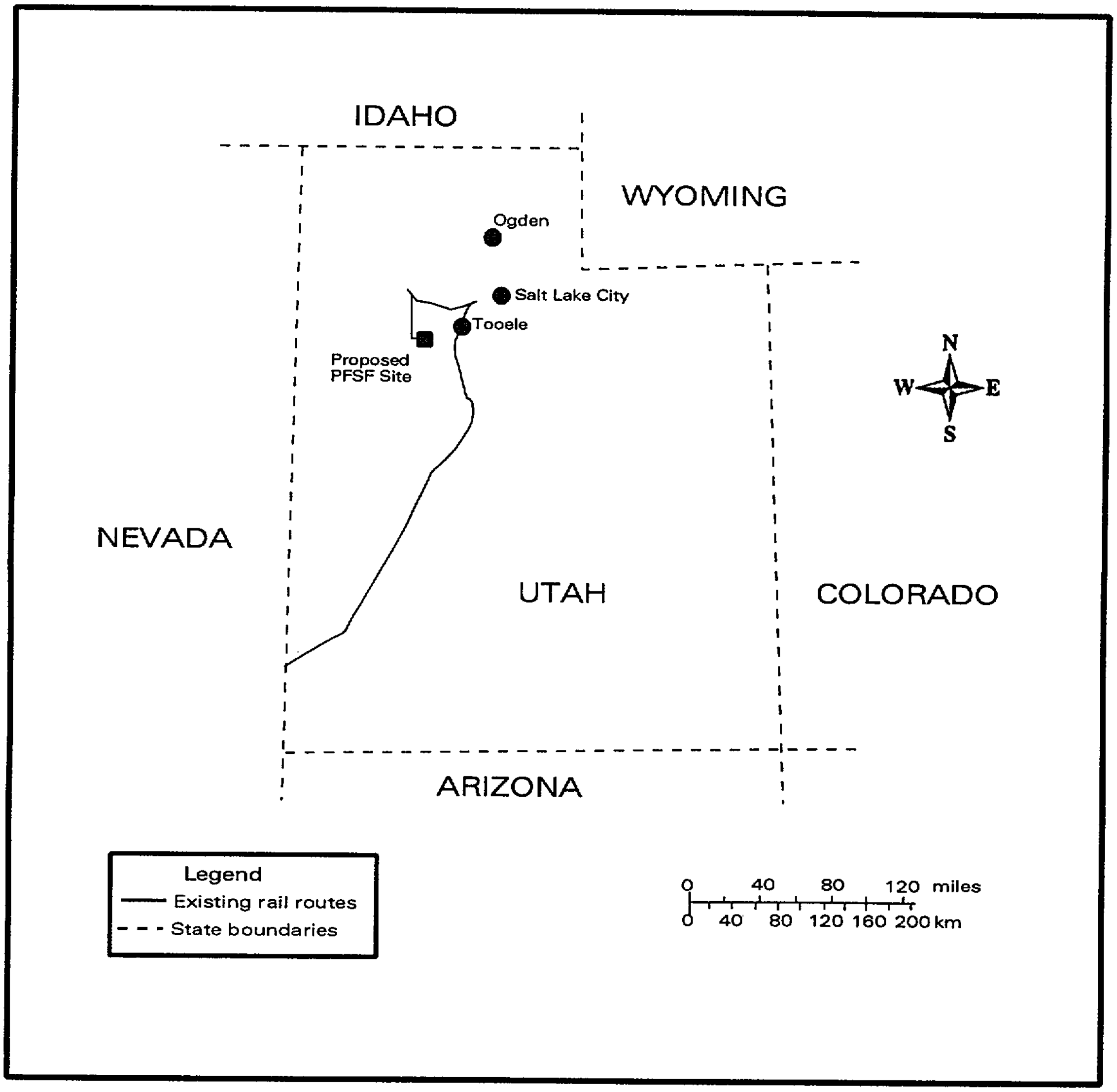


Figure 5.2. Rail route for shipping SNF from Skull Valley, Utah, toward a national repository.

increase is 325/250, or 30 percent. The number of people exposed during shipments of SNF to the proposed PFSF have been increased by 30 percent to account for population growth. Using the 1990 Census data, it is estimated that 864,029 people would live along the rail route from Maine Yankee to the proposed PFSF. Considering the 30-percent increase, it is projected that 1,123,238 people would live along the route from the Maine Yankee to the proposed PFSF. Both of these populations are much larger than the population (277,743 people) considered in NUREG-0170.

In 1990 the population of Utah was approximately 1.72 million. Based on U.S. Census Bureau information projected out to the year 2040, the state should reach a population of approximately 3.38 million, or approximately twice the 1990 population. Therefore, the data generated by RADTRAN4 for shipments from the PFSF to a permanent geological repository was multiplied by two to account for the increase in population at the time when these shipments would be made.

PFS estimates that the PFSF would receive approximately 200 casks per year. PFS also indicated that each train would average four casks; therefore, the proposed PFSF is expected to receive 50 train shipments per year. To examine the radiological impacts on the public and the crews used to ship and handle the casks, RADTRAN4 was used to calculate the impact on the public assuming that all 200 casks are shipped, one cask per train. This maximizes the radiological impact to the public and more closely resembles the way multiple casks on a train are arranged. That is, cask-carrying railcars probably would be separated by buffer cars; thus, each railcar becomes more of a separate radiation source to the public. The dose received by the train crew was similarly evaluated assuming one cask was shipped on each train and the results were multiplied by 200 shipments to obtain an annual exposure to the crew.

Package inventories and dose rates. Incident-free radiological exposure was estimated by calculating a total body dose for the transport crew and the general population from the radiation dose rate at 1 m (about 3 ft) from the package surface. Both point-source and line-source approximations were used based upon the distance between the exposed individuals and the radiation source. Because of the specific radionuclide content of PWR fuel assemblies and the number of assemblies inside each cask, PWR assemblies would produce a greater dose than BWR fuel assemblies in the event of an accident that breaches the cask. Accordingly, the staff performed the analysis based on PWR fuel. Each cask is assumed to contain 24 PWR fuel assemblies with a burnup of 40,000 MW-day/MTU and that have been cooled for 5 years. Each cask was assumed to have a dose rate of 0.13 mSv/hr at a distance of 1 m (13 mrem/hr at 3 ft) from the cask surface, which is equivalent to the regulatory limit of 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft). The source term was assumed to consist entirely of gamma radiation for calculation of the incident-free dose. NUREG-0170 assumed that a rail cask would carry no more than 7 PWR assemblies, and that the cask dose rate was 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft). Actual dose rates are expected to be lower than the regulatory limit for most casks.

Accident release fractions and release fraction probabilities. The risk associated with radiation exposure from releases of radioactive material in transportation accidents can be represented as the product of the probability of an accidental release and the consequences of the release (DOT 1998). Radiological consequences of accidents are calculated by assigning package release fractions for each of a set of 6 accident severity categories. The release fraction is defined as the fraction of the radioactive material in the package that could be released from that package during an accident of a certain severity. The accident probabilities and release fractions used in this analysis are different from those used in NUREG-0170. The accident probabilities and release fractions used in this DEIS are based on the Modal Study. The NRC staff believes that this source provides more realistic estimates of the accident probabilities and release fractions.

In March 2000, an NRC contractor report, NUREG/CR-6672, *Reexamination of Spent Fuel Shipment Risk Estimates*, was published. This report reexamined the risk associated with the transport of SNF. Cask and SNF response to collision impacts and fire were evaluated by performing three-dimensional, finite element (structural) and one-dimensional, heat transport calculations. Accident release fractions and accident severity fractions were developed to calculate the radiological risk (accident dose) from accidents. The accident dose risk was compared to dose risk calculated using NUREG-0170 and the Modal Study accident source terms. The comparison demonstrates that both studies made a number of very conservative assumptions about SNF and cask response to accident conditions, which caused their estimates of accident source terms, accident frequencies, and accident consequences to be very conservative.

5.7.2.4 Incident-Free and Accident Dose Risks from SNF Shipments to the Proposed PFSF

The dose results for the cross-country transportation analysis in this DEIS are discussed below. Presented first are the incident-free and accident dose estimates assuming SNF is transported from a typical reactor site (for the purposes of analysis: the Maine Yankee Plant) to the proposed PFSF by rail along the new Skunk Ridge rail line. This section then presents the incident-free and accident dose risk estimates assuming the SNF is shipped via the alternative of an ITF near Timpie. For this alternative, SNF would first be transported by rail to the siding at Timpie (i.e., the ITF) and then by heavy-haul vehicle down Skull Valley Road to the proposed PFSF.

Shipments to the Proposed PFSF Via Rail

Incident-free doses. Incident free doses were calculated for the general public, the train crew, and the MEI. The MEI is defined as an unshielded individual that is hypothetically positioned 30 m (98 ft) from the highway or railroad track with no intervening objects that would provide shielding, and the conveyance transporting the radioactive material considered in the analysis is modeled as passing by the MEI at a speed of 24 km/hr (15 mph). This MEI is assumed to be present at this unshielded location for the entire inventory of shipments to the PFSF (200 shipments per year for 20 years).

Table 5.9 presents the dose commitments for a one-year period and over the 20 year shipping campaign to transfer 4,000 canisters to the PFSF. Based on the analysis in this DEIS, the general public (approximately 1 million people) along rail route from a reactor site to PFSF would receive approximately 0.0918 person-Sv (9.18 person-rem) annually from the transport of 200 SNF casks to PFSF. This would result in a dose of 1.84 person-Sv (184 person-rem) over the 20-year campaign. The crew (two people per shipment) would receive a dose of 0.0122 person-Sv (1.22 person-rem) annually, and 0.244 person-Sv (24.4 person-rem) over the 20 year campaign.

These numbers are considered conservative since each shipment was projected to travel a distance equivalent to that between the Maine Yankee reactor and the PFSF, passing through significant population centers. Future U.S. population growth was accounted for by increasing population exposure by 30 percent, which would be approximately equivalent to making all shipments in the

Table 5.9. Incident free dose for SNF shipment from Maine Yankee to the proposed PFSF via rail

Dose [person-Sv (person-rem)]		Maximally exposed individual dose [Sv (rem)]	Risk (LCF)	
Transportation crew	**Public**		**Transportation crew**	**Public**
		Annual—200 casks per year		
0.0122 (1.22)	0.0918 (9.18)	1.10×10^{-6} (1.10×10^{-4})	0.000488	0.00459
		20-year campaign—4,000 casks		
0.244 (24.4)	1.84 (184)	2.2×10^{-5} (2.2×10^{-3})	0.00976	0.0918

year 2020. Based on this analysis, over 1 million people would share 0.0918 person-Sv (9.18 person-rem) from SNF shipments to the PFSF. This is about 9.18×10^{-5} mSv (0.00918 mrem) per person annually, or 0.00184 person-SV (0.184 person-mrem) for an individual exposed to this level of radiation every year over the entire 20-year shipping campaign. The corresponding LCF risks for the general public and the transportation crew are also presented in Table 5.9. The annual and 20-year campaign LCF risks for the MEI are 5.5×10^{-8} and 1.1×10^{-6} (or about one chance in 18 million and one chance in 1 million), respectively.

Accidents. To transport 200 casks per year, PFS has indicated that on average there would be 50 rail shipments carrying four casks each. A major factor in determining the consequences of an accident is the amount or fraction of radioactive respirable material released during an accident. With four casks per shipment, the amount of material released is dependent on the response of each cask to a given accident. For a train carrying only one SNF cask, estimates have been made of the likelihood that the cask will release material during an accident of a given severity. Therefore, in this analysis, these estimates were used and it was assumed each of the four casks was damaged and released material to the same extent; this should provide an upper bound to the results of the accident scenario.

For all rail shipments to the proposed PFSF, the accident dose risk was estimated to be 0.0423 person-Sv (4.23 person-rem) annually and 0.84 person-Sv (84.6 person-rem) for the entire 20-year campaign. This equates to an accident dose risk of 0.00085 person-Sv (0.085 person-rem) per shipment. The LCF risks for the annual and 20-year campaign calculated exposures are 0.00212 and 0.042, respectively.

The four casks are widely separated from each other on the train (usually by a buffer car between each cask-carrying railcar) and are unlikely to experience the same forces in an accident. Accordingly, and notwithstanding that specific estimates have not been made, it would be reasonable to expect that in an accident, all four casks would not be damaged to the extent that each one would release material and provide a source of radiation exposure to the public. If only one of the four casks were damaged to the extent radiological material was released, the dose risks to the public as presented in the preceding paragraph would be further reduced by a factor of about 3.58 to 0.0118 person-Sv (1.18 person-rem) annually and 0.24 person-Sv (24 person-rem) for the entire 20-year campaign. This equates to an accident dose risk of 0.000236 person-Sv (0.0236 person-rem) per shipment. The NRC staff believes a reasonable estimate of the risk is somewhere between the two estimates but closer to the estimate for the release from a single cask. In any event, the radiological risk from an accident during the rail transport of SNF is small.

Shipments to the Proposed PFSF Via ITF

Incident-free doses. If the new rail line is not built from Skunk Ridge, the Timpie siding is the assumed location on the Union Pacific rail line at which an intermodal transfer facility (ITF) would be built. The ITF is the facility at which the transfer of SNF shipping casks from rail to truck would take place. Transportation of SNF to the proposed PFSF via an ITF near Timpie can be divided into three major phases. The first phase is to transport SNF from the reactor site to the ITF near Timpie. PFS has indicated that this phase would take place using rail only. The second phase is to transfer the SNF from a railcar to a heavy-haul vehicle at the ITF. Finally, the SNF would be transported down Skull Valley Road using the heavy-haul vehicle to the proposed PFSF.

Table 5.10 provides estimates of the annual and 20-year campaign incident-free doses to the transportation crew, the general public, and the MEI for the ITF alternative. In general, comparing Tables 5.9 and 5.10, the ITF alternative results in additional worker impacts due to greater handling, but has very little effect on the impacts to the general public. Table 5.10 also presents the LCF risks to the crew and general public from exposure to the annual and 20-year campaign doses. The LCF risks to the MEI from exposure to the annual and 20-year campaign doses are 5.5×10^{-8} and 1.1×10^{-6} (or about one chance in 18 million of developing a fatal cancer from one year of operation and one chance in 1 million of developing a fatal cancer from 20 years of operation), respectively. The summary below describes how each phase of the transportation contributes to the totals displayed in Table 5.10.

Table 5.10. Incident free dose for SNF shipment from Maine Yankee to the proposed PFSF via an ITF near Timpie, Utah

Dose [person-Sv (person-rem)]		Maximally exposed individual dose [mSv (mrem)]	Risk (LCF)	
Transportation crew	Public		Transportation crew	Public
		Annual—200 casks per year		
0.137 (13.7)	0.0941 (9.41)	1.1×10^{-6} (1.1×10^{-4})	0.00544	0.0047
		20-year campaign—4,000 casks		
2.73 (273)	1.88 (188)	2.2×10^{-5} (2.2×10^{-3})	0.109	0.0942

Shipments from the reactor sites to the ITF via rail. The shipment of casks to the ITF generates almost identical dose commitments to the train crew and the public at large as did the shipments moving all the way to the PFSF assuming the Skunk Ridge rail connector line was built. This is because the distance from Maine Yankee to the ITF (4431 km [2747 miles])is only slightly less than the distance from Maine Yankee to the proposed PFSF [4476 km (2775 miles)]. Table 5.11 presents the projected dose received by the train crew and the population for the shipments to the ITF at the Timpie siding.

Table 5.11. Incident free dose for SNF shipment from Maine Yankee to the ITF via rail

Dose [person-Sv (person-rem)]			Risk (LCF)	
Transportation crew	**Public**	**Maximally exposed individual dose [Sv (rem)]**	**Transportation crew**	**Public**
		Annual—200 casks per year		
0.0121 (1.21)	0.0917 (9.17)	1×10^{-6} (1.10×10^{-4})	0.000484	0.00459
		20-year campaign—4,000 casks		
0.242 (24.2)	1.83 (183)	2.2×10^{-5} (2.2×10^{-3})	0.00968	0.915

SNF transfer at the ITF. Once the fuel is received at the ITF, the cask transfer activities that are expected to take place at that facility include radiation monitoring, release of the package tiedowns from the railcar, hoisting the cask off of the railcar with a crane and moving it to the heavy-haul trailer, and re-securing the cask to the trailer. The remaining casks would be held on the railcars until the heavy-haul trailer and escorts return to pick up each of the remaining casks.

At the ITF the crew would consist of four handlers and a spotter, an inspector, a crane operator and a health physics staff member. These workers would be employees of PFS and are the same workers that would be involved in unloading the cask and inspection (i.e., Type 1 and Type 2 workers) and maintenance at the proposed PFSF (see Section 4.7). The handlers would attach ropes to the ends of the cask after it is released from the railcar and help guide it into a tie-down cradle on the low-boy trailer or to the temporary storage location. The spotter would give directions to the crane operator and the handlers. The inspector would ensure that all written procedures are followed. The health physics staff member would monitor the movement and check the cask external surface doses.

The assumptions and methods for estimating the dose received by the ITF crew is part of the RADTRAN4 code and has been used to estimate the dose received by handlers and inspectors in an intermodal transfer of SNF shipping casks (Neuhauser and Weiner 1992). Using similar exposure times, the total dose received by the eight ITF workers is estimated to be 0.119 person-Sv/yr (11.9 person-rem/yr), or 2.38 person-Sv (238 person-rem) over the entire 20-year campaign of shipping SNF to Skull Valley. Details of this analysis are presented in Appendix D.

Truck shipments via Skull Valley Road. Use of an ITF located near Timpie would require that SNF casks be shipped the last 41 km (26 miles) to the proposed PFSF by heavy-haul vehicle. A rail siding and cask handling equipment will be available at the ITF site. Assuming the PFSF receives 200 casks per year, the ITF would transfer, on the average, four casks each week, and these casks are likely to come in on 1 to 2 trains for each 7-day period. One of the casks would be transferred from its railcar onto a heavy-haul trailer (see Figure 2.8). The other casks would remain on the railcars.

Shipments from the ITF to the proposed PFSF would be made only during the daylight hours. Each truck shipment to the PFSF would be accompanied by escorts: one vehicle in front and one at the rear of the heavy-haul tractor/trailer in accordance with Utah Department of Transportation Regulations for Legal and Permitted Vehicles, Section 600. The heavy-haul vehicle is expected to travel at a speed of about 32 km/hr (20 mph) over the 41 km (26-mile) road to the PFSF. The trip will take approximately 1.5 hours. It is anticipated that the two pilot/escort vehicles will travel up to 300 m (1,000 ft) ahead of and behind the heavy-haul vehicle to warn travelers of the slow moving truck. Once unloaded, the heavy-haul vehicle and escorts can return to the ITF and pick up the next cask. RADTRAN4 was used to estimate the doses to the workers involved with transporting the SNF from the ITF to the proposed PFSF. Dose calculations for these intermodal shipments are discussed below and the exposure data are presented in Table 5.12.

Table 5.12. Incident free doses for SNF shipment from the ITF to the PFSF via heavy-haul vehicle

Crew dose[a] [person-Sv (person-rem)]	Population dose[b] [person-Sv (person-rem)]	MEI dose [mSv (mrem)]	Risk (LCF)	
			Transportation crew	Public
		Annual dose, 200 casks per year[c]		
0.006 (0.6)	0.0024 (0.24)	1×10^{-6} (1×10^{-4})	0.00024	0.00012
		20-year life campaign[c]		
0.12 (12.0)	0.0472 (4.72)	2×10^{-5} (2×10^{-3})	0.0048	0.00236

[a]Assumes one driver and a dose rate of 0.02 mSv/hr (2.0 mrem/hr) in the cab; also includes exposure to four escorts
[b]The population doses have been increased by 61 percent to account for projected population increases in Utah between 1990 and 2020.
[c]Assumes 1 cask per low-boy shipment transported 41.8 km (26 miles).

Assuming there would be one driver in the truck and the dose rate in the cab is at the maximum U.S. DOT limit of 0.02 mSv/hr (2 mrem/hr), the dose to the driver would not exceed 0.03 mSv (3 mrem) for each trip. PFS could provide some small amount of additional radiation shielding for the driver, which would reduce the driver's dose to a fraction of this amount. The PFSF driver(s) would make 200 such shipments each year. Conservatively, the total accumulated dose to the drivers of the tractor would not exceed:

$$(200 \text{ shipments/yr}) \cdot (0.03 \text{ mSv/shipment}) = 6 \text{ mSv/yr } (600 \text{ mrem/yr}).$$

This translates to a maximum cumulative dose of 0.12 person-Sv (12 person-rem) for a 20-year campaign.

If the escorts drive an average of 240 m (800 ft) in front of and behind the shipping cask on the heavy-haul trailer, the dose rate in their vehicles, assuming no intermediate shielding such as the body of the vehicles they are riding in or the cab of the heavy haul truck, should not exceed 2×10^{-6} mSv/hr (0.0002 mrem/hr) (see Figure D.1 in Appendix D of this EIS). If there are two escorts in each vehicle, the four escorts would receive:

$$(200 \text{ shipments/yr}) \cdot (4 \text{ escorts/shipment}) \cdot (2 \times 10^{-6} \text{ mSv/hr per person}) \cdot (1.5 \text{ hr/shipment}) = 0.0024 \text{ person-mSv/yr } (0.24 \text{ person-mrem/yr}).$$

This translates to a maximum cumulative dose of 0.048 person-mSv (4.8 person-mrem) to the escorts for the 20-year campaign.

Information from Tables 5.11 and 5.12 has been combined with the total dose received by the ITF crew and is presented in Table 5.10. Table 5.10 summarizes the total dose both to the working crews and the population if the ITF were used to transport SNF to the proposed PFSF. By comparing Table 5.9 with Table 5.10 it is apparent that when SNF is shipped using the ITF, the dose to the crew increases about a factor of 11 over the 20-year shipping campaign [compare 0.244 person-Sv (24.4 person-rem) with 2.73 person-Sv (273 person-rem)]. However, intermodal shipments have only a minor affect on the dose received by the population in general [1.84 person-Sv (184 person-rem) using the Skunk Ridge rail line vs. 1.88 person-Sv (188 person-rem) using the ITF] because most of the exposure to the public occurs on the cross-country rail portion of the shipment which is almost the same whether the rail shipment stops at Timpie or is carried all the way to the PFSF.

Accidents. Accident dose risk for the transport of SNF from operating reactors to the proposed PFSF via the ITF would be similar to the accident dose risk discussed above for the shipments via the Skunk Ridge rail line because the largest contributor to the risk is associated with the cross-country shipment of SNF from the reactor sites to the ITF. However, additional accident dose risk is associated with the transport of SNF down Skull Valley Road. Using RADTRAN4, the accident dose risk from shipments down Skull Valley Road was determined to be 1.08×10^{-5} person-Sv (0.00108 person-rem) annually. For the 20-year campaign, this dose risk would be 0.00022 person-Sv (0.022 person-rem). This is equivalent to an LCF of 1.1×10^{-5} or about one chance in 93,000 that any individual exposed along Skull Valley Road would develop a fatal cancer from this level of exposure. These dose risk estimates reflect the expected increase in the Utah population from 1990 to 2020.

5.7.2.5 Incident-Free and Accident Dose Risks from Shipments to a Final Repository

The SNF would remain at the proposed PFSF for a number of years, after which it would be removed and transported to the final repository. This section examines the radiological risk of transporting all 4,000 SNF canisters from the proposed PFSF to the Utah-Nevada border.

For the purposes of analysis, it is assumed that the oldest SNF would be shipped to the permanent repository first, and the SNF in the canisters would have been cooled at least 20 years. It was also assumed that the shipping casks designed to bring the canisters to the PFSF would be used to ship them to the repository. This will (1) avoid the cost of designing, certifying, and fabricating new casks, (2) reduce potential handling activities, and (3) have the additional benefit of reducing the dose rate from the cask because of the decay of many of the isotopes that would be inside the canisters. Comparing 5-year-old fuel with 20-year-old fuel with the same burn-up, the radioactivity of the most significant isotopes will be reduced by a factor of two. To a first approximation, the dose rate is assumed to be reduced by this same ratio, i.e., to 0.065 mSv/hr (6.5 mrem/hr) at a distance of 1 m (3.3 ft) from the cask surface. However, the population of Utah is expected to increase about a factor of two from 1990 (at 1.72 million) to 2040 (projected to be 3.38 million), by which time the removal of casks from the proposed PFSF should be complete. The net result of reducing the external dose rate from the packages and increasing the population density is presented in Table 5.13 for a one-year campaign of transporting 200 casks and the 20-year campaign to remove all 4,000 casks by rail using the Skunk Ridge route.

Table 5.13. Annual and cumulative 20-year campaign radiation doses associated with SNF shipment from the proposed PFSF to the Utah-Nevada border via rail

Incident-free dose [person-Sv (person-rem)]		Maximally exposed individual dose [Sv (rem)]	Accident dose risk to public [person-Sv (person-rem)]
Transportation crew	Public		
		Annual—200 casks per year	
0.00218 (0.218)	8.0×10^{-4} (0.080)	5.5×10^{-7} (5.5×10^{-5})	2.23×10^{-4} (0.0223)
		20-year campaign—4,000 casks	
0.0436 (4.36)	0.0160 (1.60)	1.1×10^{-5} (1.1×10^{-3})	4.46×10^{-3} (0.446)

For the ITF alternative, the SNF would be shipped in the same casks in which the fuel was originally delivered to the PFSF and the first leg of the journey would be by heavy haul truck from the PFSF to the ITF at the Timpie rail siding. The SNF would then be loaded on a Union Pacific train for the rail portion of the trip. As described above, the fuel would have been cooled for a minimum of 20 years, and its external dose rate would have decreased by about a factor of two. Accordingly, the dose to workers who handle the casks directly, such as those who work at the ITF, would be a factor of two less than the doses estimated for the incoming cask transfers at the ITF.

The last leg of this intermodal transportation scenario would be by train. The casks would be placed on a train, and for consistency, it is assumed that each train would handle four casks. Because the final route and mode of transportation are unknown at this time, this analysis assumes the SNF would be hauled to the Utah-Nevada border. A summary of the radiation dose results is given in Table 5.14. Note that the dose received by the transport crew in the intermodal shipment

Table 5.14. Annual and cumulative 20-year campaign radiation doses associated with intermodal SNF shipment from the PFSF to the Utah-Nevada border via an ITF near Timpie, Utah

Incident-free dose [person-Sv (person-rem)]		Maximally exposed individual dose [Sv(rem)]	Accident dose risk to public [person-Sv (person-rem)]
Transportation crew	Public		
Annual—200 casks per year			
0.0669 (6.69)	0.00232 (0.232)	5.5×10^{-6} (5.5×10^{-4})	2.34×10^{-4} (0.0234)
20-year campaign—4,000 casks			
1.34 (134)	0.0464 (4.64)	1.1×10^{-5} (1.1×10^{-3})	4.68×10^{-3} (0.468)

(Table 5.14) is higher than for the crew when the shipment is entirely by rail (Table 5.13). Approximately 90 percent of the crew's dose when using the ITF is a result of transferring each cask from a heavy-haul trailer to a railcar. There is also a slight increase in the dose received by the general population, primarily from the population exposure during the truck shipping phase.

Tables 5.15 and 5.16 show the risks (as measured by LCFs) of the campaigns to remove SNF from the proposed PFSF and send it to the Utah-Nevada border.

Table 5.15. Annual and cumulative 20-year campaign health risks associated with SNF shipment from the proposed PFSF to the Utah-Nevada border via rail[a,b]

Incident-free risk (LCF)[c]		Maximally exposed individual risk (LCF)	Accident risk to public (LCF)
Transportation crew	Public		
Annual—200 casks per year			
8.72×10^{-5}	4.00×10^{-5}	2.75×10^{-8}	1.22×10^{-4}
20-year campaign—4,000 casks			
2.72×10^{-3}	8.00×10^{-4}	5.50×10^{-7}	2.44×10^{-3}

[a]Each train would carry four casks and travel 570 km (354 miles) to the Utah-Nevada border.
[b]The number of LCFs presented here may be compared to the national average lifetime risk of death from cancer from all causes, which is approximately 0.25 (about 1 in 4).
[c]The crew size would be two persons for rail transport.

Table 5.16. Annual and cumulative 20-year campaign health risks associated with intermodal SNF shipment from the proposed PFSF to the Utah-Nevada border via an ITF near Timpie, Utah

Incident-free risk (LCF)			
Transportation crew	Public	Maximally exposed individual risk (LCF)	Accident risk to public (LCF)
	Annual—200 casks per year		
2.68×10^{-3}	1.16×10^{-4}	2.75×10^{-8}	1.17×10^{-5}
	20-year campaign—4,000 casks		
5.35×10^{-2}	2.32×10^{-3}	5.50×10^{-7}	2.34×10^{-4}

5.7.2.6 Utah and Regional Impacts

The impacts of transporting SNF in the region (i.e., considered to be in and near the state of Utah) were also analyzed in detail. To analyze the regional impacts, rail access routes and route lengths were selected to cross the Utah state borders, where possible, and to accommodate convergence points from rail lines farther away from the proposed PFSF. Five different access routes (see Figure 2.7) potentially could be used to reach the proposed site in Skull Valley, Utah. The actual distance of the identified routes varies from 330 km (220 miles) to 385 km (239 miles) due to the structure of the INTERLINE rail routing network. The characteristics of each of the five routes are described in Appendix C. It is not likely that any one route would be used to transport all 40,000 MTU. However, to present an upper bound of these impacts, each route was analyzed assuming that it was used to transport all 40,000 MTU. The radiological impacts from incident-free and accidents are found in Appendix D and are summarized below.

The highest impacts to the public would be associated with the rail routes passing through Salt Lake County. For SNF shipments to the proposed PFSF along the new rail line from Skunk Ridge, the highest incident-free dose to the public would be associated with the route to Skull Valley from Green River, Utah. The estimated annual dose to the public would be 0.00619 person-Sv (0.619 person-rem). This dose corresponds to an LCF of 3.1×10^{-4}. That is, SNF transportation by rail to the proposed PFSF site would involve one chance in 3200 that any member of the exposed population would develop a fatal cancer.

For a rail accident along the Green River route, the annual dose to the public would be 0.0022 person-Sv (0.222 person-rem). This dose would produce an annual LCF of 1.11×10^{-4}. That is, the accident would involve about one chance in 9,000 that any member of the exposed population would develop a fatal cancer.

If the ITF is constructed instead of the rail line from Skunk Ridge, the route from Green River would provide the highest doses to the public. The combined annual dose to the public for SNF shipments to the Timpie siding (from Green River) and heavy-haul along Skull Valley road would be 0.0083 person-Sv (0.83 person-rem). The dose from a rail accident along route from the Green

River would be the same as described above for the situation without an ITF, but with a new rail line from Skunk Ridge.

5.7.2.7 Sabotage

The current requirement contained in 10 CFR 73.37 for safeguarding shipments from acts of sabotage was promulgated in 1980 (see the dialogue box below). The requirements were based on analytical studies that estimated the consequences from credible sabotage events. Since sabotage is a deliberate malevolent act, a meaningful probability of likelihood cannot be assigned. Therefore, analyses of sabotage focus on the consequences of such an event.

The extensive security measures required by NRC regulations make sabotage events extremely unlikely. Moreover, the casks required to be used to transport SNF are designed to withstand very substantial impacts during transport without loss of containment integrity. The cask designs should further reduce the likelihood of release of radioactive material in the extremely unlikely event of sabotage. In view of the above, if a sabotage event that results in releases did occur, it is the judgement of the NRC staff that the consequences would not be unacceptably large.

PERFORMANCE OBJECTIVES FOR SNF PHYSICAL PROTECTION REQUIREMENTS

(1) minimize the possibilities of radiological sabotage of SNF shipments, especially within heavily populated areas; and

(2) facilitate the location and recovery of SNF shipments that may have come under the control of unauthorized persons.

To achieve these objectives, the physical protection shall:

(1) provide for early detection and assessment of attempts by unauthorized parties to gain access or control over SNF shipments,

(2) provide for notification to the appropriate authorities of any attempt to sabotage a SNF shipment, and

(3) impede attempts of radiological sabotage of SNF within heavily populated areas, or attempts to illicitly move SNF shipments into heavily populated areas until response forces arrive.

5.7.2.8 Conclusion

Because the analyses performed for this DEIS used consistently conservative assumptions, the staff has confidence that the actual transportation risks associated with the proposed PFSF will not be higher than those reported here. Based on the foregoing, the staff finds that annual and cumulative radiological impacts of transporting SNF to the proposed PFSF are small. Also, the results for the proposed PFSF are consistent with earlier analyses of SNF risks reported in NUREG-0170.

5.7.3 Mitigation Measures

The human health impacts from transportation of SNF would be small and, therefore, consideration of additional mitigation measures (i.e., beyond those required by existing shipping regulations or incorporated into the design of the shipping casks) is not warranted.

5.8 Other Impacts

5.8.1 Noise

5.8.1.1 Construction Impacts

Noise impacts would result from construction of a rail line or an ITF. Construction, excavation, and earthwork activities can generate noise levels up to 95 dB (EPA 1974, 1978) in the frequency range of human hearing [dB(A)]. This noise level applies at a reference distance of 15 m (50 ft) from the source. Noise levels decrease by about 6 dB(A) for each doubling of distance from the source, although further reduction occurs when the sound energy has traveled far enough to have been appreciably reduced by absorption into the atmosphere. Absorption depends strongly on the frequency of the sound. Typical absorption of low-frequency construction-related sounds is about 1 dB per km (1 dB per 0.6 mile) (Campanella 1992).

Construction of a new rail line could generate daytime noise levels of up to 95 dB(A) [at 15 m 50 ft) from the source for brief periods. At distances greater than about 3 km (2 mi), expected maximum noise levels from construction would be less than the 45 dB(A) recommended by EPA (1978) for protection against indoor activity interference and annoyance. Because of the remote location of the rail line, people other than construction workers are not likely to be within 3 km (2 mi) of those construction activities. When such activities would occur near Interstate 80 (such as for the Skunk Ridge rail siding or the ITF, they would not produce much additional noise for automobile passengers, as is verifiable from experience traveling near construction areas along major highways. For vehicle passengers traveling along Interstate 80, this noise would be difficult to distinguish from the background traffic noise [typically around 75 dB(A) for an automobile passenger (EPA 1978)] at distances of 200 m (650 ft) or more from the construction

5.8.1.2 Impacts During Operations

The loudest potential noise source associated with the operation of a delivery locomotive would be the train whistle. These whistles must be loud for safety reasons, and can reach levels of 120 dB at 15 m (50 ft). Train whistles are often audible at distances greater than 1.6 km (1 mile) during daytime hours, and would be audible at even greater distances where background levels are as low as in Skull Valley. However, at distances greater than 1 km, the absorption of sound energy by the atmosphere is no longer negligible, and noise decreases by more than 6 dB(A) for each doubling of distance from the source, especially in the higher frequencies corresponding to a whistle (Campanella 1992). Further, any train whistles that may sound (e.g., at grade crossings) would be in a sufficiently remote area that people other than transportation personnel would not be likely to be close enough to hear it. Routine locomotive operation would only occur during brief periods when transfer or movement of a shipping cask is taking place. Further, the trains involved would be moving slowly and would not be hauling boxcars, therefore their noise level would not be as great as a typical train [95 dB(A)], but would be closer to the 85 dB(A) level expected for a heavy-haul truck transporting a cask to the site.

Because of the remote location of the proposed rail line and the infrequent train traffic, noise impacts from construction and operation would be expected to be small.

5.8.1.3 ITF and Use of Skull Valley Road

PFS's ER indicates that noise levels could be as high as 85 dB(A) at a distance of 15 m (50 ft) from the roadway during brief periods when heavy-haul truck transportation of casks is in progress (PFS/ER 2000). This noise level, which would be expected to occur on average about 4 times per week, is about the same as conventional tractor-trailers at normal highway speeds using Skull Valley Road. Because the heavy-haul vehicle would operate on Skull Valley Road at reduced speeds, the duration of such noise for nearby residents would be greater than for other highway vehicles. However, noise during transportation of SNF would occur only during daytime hours, when it is least likely to be annoying. Therefore, noise would be noticeable, and could be distracting at times. The noise impacts from this activity are expected to be moderate in the vicinity of Skull Valley Road during periods when the heavy haul vehicles are passing, and would otherwise be small.

5.8.1.4 Alternative Site B

A new rail corridor to Site B would require a small percentage more construction than required for the preferred alternative because of the greater distance involved; a proportionally longer construction period would be expected. However, noise impacts from railway construction are expected to be small for rail access corridors to either Site A or Site B. If the selection of Site B would result in a more southerly location of the road from Skull Valley Road to that site, noise impacts could be appreciably greater than for Site A at the nearest residences.

Noise impacts from locomotives along the new access corridor or heavy-haul vehicles along Skull Valley Road would be the same for both Site A and Site B. If the road from Skull Valley Road to Site B is located further south than for Site A, noise impacts of operation at the nearest residences would also be greater at the nearest residences.

5.8.1.5 Mitigation Measures

Impacts can be mitigated by noise barriers, which are often costly and are not warranted based on the level of impact. Assurance that construction-related vehicles are equipped with state-of-the-art mufflers can be very effective in reducing some of the most annoying noises from construction vehicles.

Noise impacts from trains can be mitigated by noise barriers, which would be costly, would have negative aesthetic impacts, and could impede movements of animals along the right of way. Sound propagation varies strongly with frequency; low frequency sounds (e.g., a tuba) can be heard at much greater distance than can high frequency sound (e.g., a flute) of the same energy level. Adjusting the frequency of train whistles could greatly reduce noise effects at distances beyond 1 km (3,300 ft).

5.8.2 Scenic Qualities

Construction and operation of the proposed rail line and siding or ITF would change the scenic quality of Skull Valley. Construction would create the short-term visual impacts of additional dust from the operation of heavy equipment on-site and additional vehicle traffic on local roads. Construction of the rail line would also have long-term visual impacts because the line would represent a visual contrast in the undeveloped area between Interstate 80 and the proposed PFSF site. Operation of the rail line would create long-term visual impacts by introducing railroad traffic to the undeveloped area between Interstate 80 and the proposed PFSF site. Operation of the ITF would have the long-term visual impacts of increasing truck traffic on Skull Valley Road.

Changes in the scenic quality of the landscape due to construction and operation of the new rail line and siding would represent moderate impacts to recreational viewers, small to moderate impacts to residents of Skull Valley, and small impacts to motorists traveling on Interstate 80. The staff concludes that construction and operation of the ITF would represent small to moderate impacts to the same groups. The following discussion explains the staff's conclusions, which are based on an analysis similar to that described in Section 4.1.8.2.

5.8.2.1 Recreational Viewers

Recreationists in Skull Valley and in areas adjacent to the valley would be able to view the new rail line and siding and the ITF. Recreationists in the Cedar Mountains would be able to view the rail line and siding (see Figure 5.3), while recreationists in the Stansbury Mountains might be able to view the ITF. However, the ITF would be located in a more developed area (i.e., adjacent to Interstate 80) than most of the new rail line, and would have less significant visual impacts. For many recreationists, particularly those seeking wilderness experiences in the Cedar Mountains, the new rail line in the midst of the nearly undeveloped landscape south of Interstate 80 would represent a noticeable contrast and a moderate visual impact.

5.8.2.2 Local Residential Viewers

The new rail line could be visible to residents of the Goshute Village. However, the rail line is approximately 20 km (12 miles) from the village. For some members who live on the Reservation, the aesthetic impact of the new rail line could be considered large. The staff concludes aesthetic impacts of the new rail line on residents would likely be moderate because its visual presence would alter the scenic qualities of Skull Valley as viewed from residential areas.

Figure 5.3. Artist's rendering of the proposed Skunk Ridge rail line as viewed from the Cedar Mountains.

5.8.2.3 Motorists on Interstate 80

The new rail line and siding and the ITF would be highly visible to motorists on Interstate 80 (see Figures 5.4 and 5.5). However, it is likely that visual impacts to these motorists would be small because they would view the new facilities in the context of existing development along Interstate 80. For example, the portion of the new rail line that would be visible from Interstate 80 would be an extension of the existing rail network that parallels Interstate 80 west of Salt Lake City. Also, it is likely that many motorists on Interstate 80 would not be as sensitive to the visual changes as some recreationists and local residents. Thus, the staff concludes that the visual impact of the proposed rail line and siding or the ITF on motorists on Interstate 80 would be small because the visual presence of these facilities would neither alter noticeably nor destabilize the scenic qualities of Skull Valley as viewed from Interstate 80.

5.8.2.4 Mitigation Measures

To the extent that they are applicable, the measures discussed in Section 4.8.2 should be used to mitigate the visual impacts of the new rail line and siding or the ITF. PFS should consult with the BLM before planting any vegetation along the rail line to avoid creating a narrow, contrasting band of vegetation (i.e., a "green ribbon") through Skull Valley.

5.8.3 Recreation

Recreational uses of the land in Skull Valley include such activities as driving off-road vehicles, bird watching, and hiking. Direct and indirect impacts to recreational resources and opportunities during construction and operation of the new rail siding and corridor or the new ITF near Timpie and heavy-haul transport of SNF to the proposed site are expected to be small. The following paragraphs identify the potential for direct and indirect impacts associated with constructing each of these facilities, using these facilities to transport SNF to the proposed PFSF site, using these facilities to transport SNF to the Alternative Site B, and any mitigation measures that would reduce or ameliorate adverse impacts.

5.8.3.1 Construction Impacts

Direct impacts are primarily associated with any physical changes to those resources and opportunities that would result from construction of the transportation option. Indirect impacts are primarily associated with workers who might move into the area during construction of either of the local transportation options and who might place additional demands on existing resources and opportunities. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

Activities associated with construction of the proposed rail line, including the movement of materials and workers to and from the rail head at Skunk Ridge and along the rail route, have the potential to affect recreational resources and opportunities. Impacts include the possible addition of obstacles (in the form of elevated roadbed) to existing unimproved roads ("jeep roads"), trails, or paths. Current unhindered access from Skull Valley to portions of the Cedar Mountains might be impaired at those locations where adequate rail crossings were not provided. The proposed rail route and alignment of

Figure 5.4. Artist's rendering of the proposed Skunk Ridge rail line as viewed from the Interstate 80 off-ramp at the Low interchange.

Figure 5.5. Artist's rendering of the proposed Intermodal Transfer Facility as viewed from the median of Interstate 80.

the rail line from Skunk Ridge does not intersect or cross the existing Cedar Mountain WSA in the northern portion of the Cedar Mountains. The route passes within approximately 800 m (0.5 mile) of BLM lands found to contain wilderness characteristics. Hastings Pass, a segment of the California Trail, a designated National Historic Trail, is the northern boundary of newly inventoried BLM lands determined to contain wilderness characteristics. Persons wishing to use recreational resources within the Cedar Mountains WSA or other areas in the Cedar Mountains may expect delays during construction of the rail line. These impacts are expected to be occur throughout the 14-month construction period. However, PFS's construction activities are expected to occur during the week and would not be expected to affect weekend use of the Cedar Mountain WSA or other nearby areas by recreational users.

Since demand on recreational resources varies directly with population, indirect impacts to recreational resources and opportunities are expected to be small due to the small amount of worker in-moving expected during construction of the proposed rail line. As indicated in Section 5.5, the number of in-moving workers is sufficiently small, even when added to any accompanying family members (approximately 0.3 percent of the Tooele County total population in 1996), that any increased demand placed by those workers and family members should not result in a noticeable effect on recreational resources and opportunities in the Cedar Mountains.

Activities associated with construction of the ITF near Timpie, including the movement of materials and workers to and from the construction site, have a very small potential to affect recreational resources and opportunities in the Skull Valley area. The location of the ITF, just off Interstate 80, would not affect recreational users' access to existing recreational resources and opportunities.

As with the proposed rail line, the indirect impacts are expected to be small due to the small workforce and any in-moving (approximately 0.1 percent of the Tooele County total population in 1996) associated with construction of the ITF (see Section 5.5).

5.8.3.2 Impacts During Operations

Direct and indirect impacts to recreational resources and opportunities during operation of the proposed rail line from Skunk Ridge to the proposed facility or the ITF and associated heavy-haul truck movement of SNF to the proposed facility are expected to be small. Activities associated with use of the rail line from Skunk Ridge to the proposed PFSF facility (i.e., two to four rail shipments per week over the life of the facility) would have minimal effect on recreational users of the Cedar Mountains and other areas on the western side of Skull Valley. Access to these areas over unimproved roads would not be curtailed during the operational period, except for the actual period of time it would take for a shipment to move past such an access road.

Indirect impacts to recreational resources and opportunities are expected to be small due to the small amount of worker in-moving expected during operation of the proposed rail line. The number of in-moving workers is sufficiently small, even when added to any accompanying family members, that any increased demand placed by those workers and family members should not result in a noticeable effect on recreational resources and opportunities in the Cedar Mountains.

Activities associated with operation of the ITF near Timpie, including the movement of heavy-haul trucks carrying SNF from the ITF down Skull Valley Road to the proposed facility, have a small potential to affect recreational resources and opportunities in the Skull Valley area. The location of the ITF, just off Interstate 80, would not affect recreational users' access to existing recreational resources and opportunities. However, persons wishing to use Skull Valley Road to access recreational resources such as Horseshoe Springs or the Deseret Peak Wilderness would need to expect delays during the movement of the slow-moving heavy-haul trucks, currently planned for two to four round trips per week for the life of the facility. PFS's use of Skull Valley Road is expected to occur during the week and would not be expected to affect weekend use of Skull Valley Road by recreational users.

As with the proposed rail line, the indirect impacts of using the ITF/heavy haul local transportation option are expected to be very small due to the small workforce (estimated at four workers) and any in-moving associated with operation of the ITF.

5.8.3.3 Alternative Site B

The alternative location (i.e., Site B) in Skull Valley for the proposed facility lies just south of the preferred site. Because Site B is very close to the preferred site, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during either construction or operation of either of the local transportation options.

5.8.3.4 Mitigation Measures

Given the small magnitude of the impacts to recreational resources and opportunities expected to result from construction and operation of either of the two local transportation options of the proposed facility, no mitigation measures were identified that would appreciably reduce the impact.

5.8.4 Wildfires

Operation of a rail line from Skunk Ridge could result in fires from equipment sparking, as has been reported to occur elsewhere in the west (AmeriScan 1999); however, approximately three fires already occur each year in Skull Valley. Table 5.17 shows the number of fires, and the size of land affected, that occurred in BLM's Salt Lake District between 1989 and 1998. The Salt Lake District includes Skull Valley.

As can be seen in Table 5.17 fires caused by lightning dominate the number of fires in the region, as well as the acreage affected by fires. Fires caused by railroads account for only 1.7 percent of the number of all fires and only 0.5 percent of all acreage affected by all fires. When only human-caused fires are considered, fires caused by railroads account for about 10 percent of those fires and about 1.3 percent of the acreage burned by human-caused fires.

PFS will own or lease and maintain the rail equipment used for delivery of SNF to the storage facility. This equipment will utilize the latest design innovations (train monitoring, breaking systems, etc.) to reduce the risk of wildfires due to rail transport. It is inherent in the design of rail equipment that sparks can be produced by the steel wheels of railroad trains in contact with the steel rails. Unlike cars and trucks, the axles on a train do not have differentials that permit the two wheels on one axle to rotate at different rates around curves. When a train moves around a curve, one of the wheels on the same axle slides along the rail to some extent, and this has a tendency to generate sparks.

Table 5.17. Number of fires and acres burned in BLM's Salt Lake District, 1989 through 1998

Cause of fire	Number of fires	BLM acres burned	Other acres burned	Acreage burned
Natural (lightning)	505	169,244	83,603	252,847
Human causes:				
Campfire	17	25	164	190
Smoking	8	1,270	287	1,557
Fire use	12	1,363	460	1,824
Incendiary	11	13,080	6,835	19,915
Equipment use	27	25,028	2,323	27,350
Railroads	15	607	1,359	1,966
Juveniles	2	11	0	11
Miscellaneous	53	67,319	28,833	96,152
Non-specific human-caused	1	0	0	0
Subtotal (all human caused)	146	108,704	40,261	148,965
Not classified	237	2,269	3,054	5,324
TOTAL	433	27,921	651	401,636

Notes:
(1) Data exclude false alarms.
(2) To convert acres to hectares, multiply the acreage by 0.405

Sparks can also be generated when the locomotive wheels slip while pulling a train uphill. There will be very few curves (no sharp curves) and no steep grades along the proposed Skunk Ridge rail corridor. Nevertheless, the possibility exists of sparks being produced by rail transport.

If a driver were to toss a lighted cigarette out the window of the vehicle, it is possible that a wildlife could start. This could occur whether the vehicle is a heavy haul truck or train, with similar likelihoods of starting a fire. Since trains can produce sparks from the metal rails, a condition that does not exist with the heavy haul option, it is considered that rail transport would have a slightly higher probability of causing wildfires than heavy haul truck transport. However, as noted above, the Skunk Ridge rail corridor with its minimum number of curves, no steep grades, and use of the latest equipment design innovations will minimize the risk of sparks that could lead to wildfires.

Because there is no evidence that the proposed rail line from Skunk Ridge would be more prone to cause fires than other railroad operations in BLM's Salt Lake District, it is concluded that the presence of the new rail line would not add significantly to the existing risk of fire in Skull Valley.

However, fires occurring on BLM land are investigated and a report is generated describing the cause of the fire. If it is determined that the rail line operation is the cause of the fire, PFS would be obligated to pay for the cost of suppression.

If post-construction revegetation of the rail corridor follows BLM's fire management plan for Skull Valley (see BLM 1998c), it would be possible for the rail corridor to function as a green strip to help prevent the spread of both wildfires and those caused by operation of the rail line. Revegetation is discussed in detail in Section 5.4. The planting of species that both retard fires and also rehabilitate some of the areas where invasive annuals are currently growing could benefit vegetation by increasing biodiversity and improving local ecosystems.

The presence of the new rail line could also interfere with efforts to fight wildfires in Skull Valley. The elevated railbed could limit access across Skull Valley in an east-west direction and may impede the progress of fire-fighting personnel and equipment. The proposed rail line would include several rail crossings that could minimize the potential for the elevated railbed to adversely impact fire-fighting efforts.

5.8.4.1 Mitigation Measures

To mitigate potential impacts to fire fighting efforts, PFS should consult with BLM to determine the correct frequency of rail crossings. The cooperating agencies recommend that this mitigation measure be required (see Section 9.4.2). The potential for fire resulting from rail line operations could be further reduced by the use of modern rail equipment and good maintenance.

5.9 Decommissioning

Decommissioning activities are described in Section 2.1.6; however, the actual actions taken to decommission the transportation corridor cannot be predicted at this time. If the decommissioning of the rail corridor or ITF is elected then the impacts similar to those described in the following paragraphs could occur.

5.9.1 Skunk Ridge Rail Line Corridor

Upon expiration of the right-of-way, the rail line would be removed and reclaimed in accordance with the Plan of Development and right-of-way grant from the BLM. This plan calls for the rail and ballast to be removed and the remainder of the grade to be recontoured and reseeded. PFS would also need to file an application for abandonment authority with the STB. The potential environmental impacts of abandoning the rail corridor would be addressed by further NEPA documentation at that time; however, it is expected that the types of impacts that would accompany the removal of the Skunk Ridge rail siding and rail corridor would be similar to or less than those associated with the construction of those facilities. These impacts have been determined to be small to moderate (see Sections 5.1 through 5.8). The rail bed ballast and subballast would be removed and recovered for future reuse. The steel rails could be removed and reused or recycled as scrap metal. Revegetation would occur in a manner similar to that for decommissioning and closing the proposed PFSF (see Section 4.9).

5.9.2 New ITF Near Timpie

Under the alternative of constructing and operating an ITF near Timpie, the current decommissioning plans call for the ITF to be dismantled and removed upon closure of the proposed PFSF and the area recontoured and revegetated with appropriate native plant species (see the discussion of revegetation in Section 4.9). The types of impacts that would accompany the removal of the ITF would be similar to those discussed in Sections 5.1 through 5.8 for the construction of the facility. These impacts have been determined to be small.

The rail bed ballast and subballast from the rail sidings at the ITF would be removed and recovered for future use. The steel rails could be removed and recycled as scrap metal. The foundations of the building, the loop road, and the access road would be demolished and converted into solid waste that would be sent to an appropriate landfill for disposal.

5.9.3 Potential Worker Injuries During Decommissioning

The proposed rail line may be left in place for future uses. However, should the rail line be decommissioned, the staff has assumed that it would take the same amount of time and number of workers to complete the decommissioning activities as it would be originally to construct the rail line. Thus, the estimates above for construction of the rail line can be applied to decommissioning (see Table 5.4). Using this same line of reasoning, the estimates above for the construction of the ITF can also be applied to its decommissioning.

6. SUMMARY OF IMPACTS

Chapter 4 presents the potential environmental impacts of constructing and operating the proposed PFSF on the Reservation. Chapter 5 presents the environmental impacts of constructing and operating new SNF transportation facilities in Skull Valley. This chapter combines the findings of Chapters 4 and 5 and presents the potential environmental impacts from the perspective of the whole project as proposed by PFS. This chapter presents and summarizes the information needed to compare the potential environmental impacts among and between alternatives. A detailed comparison is contained in Chapter 9.

This chapter discusses the following combinations of alternatives from Chapters 4 and 5:

- Alternative 1: PFS's proposed action: Construction and operation of the proposed PFSF at Site A on the Reservation, a new rail siding at Skunk Ridge, and a new rail corridor connecting the Skunk Ridge siding with Site A.
- Alternative 2: Construction and operation of the proposed PFSF at Site B on the Reservation, with the same Skunk Ridge rail siding and rail corridor as described above.
- Alternative 3: Construction and operation of the proposed PFSF at Site A, and construction and operation of a new ITF near Timpie with the use of heavy-haul vehicles to move SNF down Skull Valley Road.
- Alternative 4: Construction and operation of the proposed PFSF at Site B, with the same ITF as described above.

This chapter presents no new analyses not already included in Chapters 4 or 5, with the exceptions of environmental justice and the no-action alternative. Rather, this chapter brings together the analyses from those previous chapters and (in Section 6.1) offers a combined interpretation of the impacts from those chapters. In addition, this chapter presents the cumulative impacts of the entire project (see Section 6.3); provides a project-wide discussion of environmental justice (see Section 6.2); discusses the unavoidable adverse environmental impacts (see Section 6.4), the relation of the short-term uses of the environment and its long-term productivity (see Section 6.5), the irreversible and irretrievable commitment of resources (see Section 6.6) for the whole project; and presents the potential environmental impacts of the no-action alternative (see Section 6.7).

6.1 Impacts of the Proposed Action and Its Alternatives

Table 6.1 summarizes the significance levels of the combined impacts of constructing and operating the proposed PFSF and the proposed new transportation facilities in Skull Valley. A detailed discussion of the entries in Table 6.1 is presented in the following subsections.

6.1.1 Geology, Minerals, and Soils

This section discusses the combined impacts to the soils and economic geologic resources from the combined actions described in Chapters 4 and 5.

Table 6.1. Summary of significance levels of the combined potential impacts for Skull Valley alternatives addressed in this DEIS

Potentially impacted resource or category	Proposed action (i.e., Site A with the rail corridor)	Site B with the rail corridor	Site A with the ITF	Site B with the ITF
Geology, minerals, and soils	SMALL	SMALL	SMALL	SMALL
Water resources				
Surface water	SMALL	SMALL	SMALL	SMALL
Flooding	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Water use	SMALL	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL
Air quality	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Ecological resources				
Vegetation	SMALL	SMALL	SMALL	SMALL
Wildlife	SMALL	SMALL	SMALL	SMALL
Wetlands	SMALL	SMALL	SMALL	SMALL
Perennial and ephemeral streams	SMALL	SMALL	SMALL	SMALL
Threatened and endangered species	SMALL	SMALL	SMALL	SMALL
Socioeconomics and community resources				
Human population	SMALL	SMALL	SMALL	SMALL
Housing	SMALL	SMALL	SMALL	SMALL
Education	SMALL	SMALL	SMALL	SMALL
Utilities	SMALL	SMALL	SMALL	SMALL
Solid and sanitary waste	SMALL	SMALL	SMALL	SMALL
Traffic	MODERATE TO LARGE	MODERATE TO LARGE	MODERATE TO LARGE	MODERATE TO LARGE
Economic structure[a]	SMALL TO MODERATE (but beneficial)	SMALL TO MODERATE (but beneficial)	SMALL TO MODERATE (but beneficial)	SMALL TO MODERATE (but beneficial)
Land use (including rangeland)	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Cultural resources	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL

Table 6.1. Continued

Potentially impacted resource or category	Proposed action (i.e., Site A with the rail corridor)	Site B with the rail corridor	Site A with the ITF	Site B with the ITF
Human health impacts				
Non-radiological risks to workers	SMALL	SMALL	SMALL	SMALL
Radiological doses to the public	SMALL	SMALL	SMALL	SMALL
Radiological doses to workers	SMALL	SMALL	SMALL TO MODERATE	SMALL TO MODERATE
Radiological non-transportation accidents	SMALL	SMALL	SMALL	SMALL
Transportation of SNF	SMALL	SMALL	SMALL	SMALL
Radiological transportation accidents	SMALL	SMALL	SMALL	SMALL
Non-radiological transportation accidents	SMALL	SMALL	SMALL	SMALL
Noise	SMALL	SMALL	SMALL	SMALL
Scenic qualities	MODERATE	MODERATE	MODERATE	MODERATE
Recreation	SMALL	SMALL	SMALL	SMALL
Environmental justice	SMALL	SMALL	SMALL	SMALL

[a]Economic benefits to the Skull Valley Band would be large.

6.1.1.1 Impacts of Alternative 1

Soils and economic geologic resource impacts occur from the construction and operation of the proposed PFSF and the Skunk Ridge rail line. Soils resources used in the soil/cement pad base mixture would be permanently lost; however, they constitute only a small percentage of the similar available soils in the valley. The remainder of soils are used in project construction as slope or embankment dressing, and these soils are recoverable upon facility decommissioning. No excess soils would be generated that require off-site shipment or disposal.

Economic geologic resources (e.g. aggregate) would be required for construction, and sufficient material is available locally to meet these needs. Like the soils resource, aggregate materials used in construction are recoverable upon facility decommissioning and are not lost. Other economic geologic resources (such as minerals or oil and gas) would be unavailable for exploitation during facility construction and operation. However, similar minerals are widely available elsewhere in the region.

In summary, impacts of the proposed action on the soils and economic geologic resources is small.

6.1.1.2 Impacts of Alternative 2

The impacts on the soils and economic geologic resources from Alternative 2 are similar to those from Alternative 1.

6.1.1.3 Impacts of Alternative 3

Soils and economic geologic resource impacts occur from the construction and operation of the proposed PFSF and the ITF. Soils and economic resource impacts for the proposed PFSF are the same as those in the proposed action. Fewer mineral resources would be required for construction of the ITF than the new rail line. However, since these materials are readily available locally and can be recovered at decommissioning, the impacts of this alternative are not significantly different than those associated with the proposed action.

6.1.1.4 Impacts of Alternative 4

Soils and economic geologic resource impacts for this alternative are similar to those of using Site A with the ITF.

6.1.2 Water Resources

6.1.2.1 Impacts of Alternative 1

Surface water. Construction and operation of the proposed PFSF with the new rail line and the proposed access road would have small impacts on surface water hydrology. Under extreme flooding conditions during construction, small to moderate impacts could result from soil erosion and sedimentation of surface water channels. No adverse impacts on surface water quality are anticipated.

The proposed PFSF design includes earthen berms to protect the fuel storage pads and related facilities from flooding up to and including the PMF. The access road and rail line would cross channels that carry ephemeral flows during wet seasons and would also carry surface water flow during floods. All drainage features under access route embankments, including the access road and the rail line, are designed to carry flood water volumes that would occur during the 100-year storm event. Some portions of the access road and rail line would be inundated by as much as 1 m (3 ft) of floodwater during a flood of PMF severity. The presence of the PFSF and its access routes would not increase downstream flooding potential. During extreme flooding some temporary water ponding would likely occur upstream of the access road and railroad culverts within the floodways associated with surface runoff channels.

Potential impacts related to surface water hydrology include minor localized channel alterations that would be caused by the presence and functioning of flood control berms at the proposed PFSF, and embankments and culverts associated with the site access road and the rail line. Ephemeral surface runoff in the dry washes upslope of the facility would be re-routed around the facility. Channel modifications along access routes would be minimized by use of energy dissipating structures and materials at culvert inlets and outlets; however, some changes in channel morphology and sediment distribution would likely occur within short distances upstream and downstream of channel crossings.

Groundwater. Small impacts to groundwater availability or groundwater quality could occur as a result of construction and operation of the PFSF and the rail line access.

Groundwater from wells at or near the site would be used for human consumption at the site and to provide water to the concrete batch plant at the site. The estimated peak groundwater use rate during construction would be about 20 to 40 L/min (5 to 10 gal/min). One or more wells on site would be required to provide the required groundwater volume. There is uncertainty as to the adequacy of the aquifer at the site to produce the required quantity of water required for facility construction and operation; however, PFS has identified an alternate water supply, if required. Use of groundwater from the site at the estimated rate would not be expected to impact other existing groundwater users in Skull Valley.

To fulfill project construction water requirements, water would be acquired from offsite sources and transported to the site and access routes for use in dust control, soil compaction, and mixing of soil cement for the storage pad foundations. Water of sufficient quantity and quality is commercially available within trucking distance of the construction areas. Approximately 242,266 m^3 (64 million gallons) of water would be required for rail line construction, and approximately 60,567 m^3 (16 million gallons) for Phase 1 construction of the site.

No activities or processes would occur at the proposed PFSF that would adversely impact groundwater quality. Stormwater runoff from the SNF storage pads and process areas, which is not expected to contain contaminants, would flow into a surface water detention basin where percolation into site soils and evaporation would occur. The facility would have two septic tanks with leach fields. Assuming that BMPs would be used in the event of leaks or spills of vehicle fuels, there would be no potential for petroleum contamination of groundwater.

6.1.2.2 Impacts of Alternative 2

The hydrological impacts of using Site B in Skull Valley with the rail line are expected to be small and would be similar to using Site A with the rail line, since Site B and Site A are directly adjacent to one another, and the site soils, surface water, and groundwater characteristics are similar.

6.1.2.3 Impacts of Alternative 3

The hydrological impacts for the option of constructing the ITF and using Skull Valley Road would be small, as discussed below.

Surface water. Potential surface water impacts using Site A with the ITF and heavy haul truck transport of the SNF shipping casks would have small impact on surface water features. There is no potential for flooding at the ITF site. Construction of the ITF would require approximately 22,000 m^3 (5.6 million gallons) of water for earthwork and cement.

Groundwater. There would be no significant differences in groundwater use if the ITF were used rather than the rail line. There would be a somewhat smaller potential for construction-related leaks or spills of vehicle fuel if the ITF and Skull Valley road were used rather than the proposed rail line corridor. Use of Skull Valley Road for fuel cask transport would slightly increase the possibility of vehicle accidents resulting in spills that could impact surface water or groundwater quality.

6.1.2.4 Impacts of Alternative 4

The hydrological impacts of using Site B in Skull Valley with the ITF are expected to be small and would be similar to using Site A with the ITF, since Site B and Site A are directly adjacent to one another, and the site soils, surface water, and groundwater characteristics are similar.

6.1.3 Air Quality

6.1.3.1 Impacts of Alternative 1

As discussed below, the temporary and localized effects of construction could produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity along the proposed rail line and small impacts elsewhere. Air quality impacts of operation would be small.

Analysis using the EPA air dispersion model ISCST3 (EPA 1995), discussed in Section 4.3, indicates that air quality impacts would be largely confined to an area well within 3 km (2 miles) of any construction activities, and within much lesser distances with routine mitigation of fugitive dust. Because of the large distance between the proposed storage facility and most of the related rail line, natural air dispersion processes would greatly dilute any pollution plume arising from rail line construction before it could mix with pollutants from the proposed PFSF, and vice-versa; therefore, impacts would not be additive except when that portion of the rail line adjacent to the storage site is under construction. That case was considered in the modeling of site construction in Section 4.3, where some rail line construction was included. The impacts from construction of the rail line are described in Section 5.3. Other effects would not be additive.

Combined effects of operation would be dominated by pollutant products of the fossil fuel combustion to power locomotives. Air quality impacts of the switchyard locomotive and other vehicles and equipment used during operation would be small.

6.1.3.2 Impacts of Alternative 2

The impacts of Site B and the rail line would be difficult to distinguish from those for Site A with rail transport and would therefore be small to moderate. Construction would have to include about 3 percent more rail line; and proportionally more pollutants would be generated each time a locomotive used the line.

6.1.3.3 Impacts of Alternative 3

As in the case of rail transport, the distance between the ITF and the storage facility precludes any appreciable combined effects of pollution from both sources, for both construction and operation of the proposed facility. Thus, the combined effects are small. Road construction adjacent to the storage facility was included in the modeling of fugitive dust from construction in Section 4.3, and has therefore been considered as a part of the storage facility construction. Because the ITF would obviate the need to construct a rail line, a large amount of rail line construction would be eliminated if this combination of options were chosen, and much less construction-related dust would reach Interstate 80. Air emissions from cask-transport vehicles would be similar to those of locomotives under the rail-line alternatives.

6.1.3.4 Impacts of Alternative 4

The impacts of Site B with the ITF would be similar to those for Site A with an ITF facility, and would be small.

6.1.4 Ecological Resources

6.1.4.1 Impacts of Alternative 1

Vegetation. Combined direct impacts on vegetation of the construction of the proposed PFSF and a rail corridor and siding to the site would involve clearing approximately 408 ha (1,008 acres) of land (Table 2.4), covered primarily by degraded desert shrub/saltbush vegetation with a high proportion of non-native cheatgrass. About 29 percent [120 ha (295 acres)] of this cleared area would be occupied for the life of the project by buildings, the cask storage pads, the access road, the rail corridor and siding, and other ancillary facilities. The remaining 71 percent [288 ha (713 acres)] of the cleared area would be revegetated, either with native species or crested wheatgrass. Because (1) the total area cleared amounts to less than 0.4 percent of the land area of Skull Valley, (2) the existing vegetation is already heavily disturbed and dominated in many areas by non-native species, (3) no unique or sensitive areas of vegetation are known to occur in the vicinity of the proposed project, and (4) substantial portions of the areas cleared would be replanted with either native species or a perennial grass, the impacts on vegetation are considered to be small.

Potential indirect effects of fugitive dust from construction of the proposed PFSF and rail line on vegetation are expected to be small because dust control measures would be used throughout the construction period, and the existing vegetation in this type of environment is not sensitive to such emissions.

Direct and indirect impacts of operation of the proposed facility on vegetation would be small. During operation of the proposed facility, no additional disturbance of soils or vegetation would occur beyond that already discussed for construction; hence no additional impacts from the disturbance of soils or vegetation should occur. Other potential impacts include additional wildfires from equipment sparking as has been reported to occur elsewhere in the west (AmeriScan 1999). No other indirect impacts to vegetation are anticipated from operation of the proposed PFSF and rail line because atmospheric emissions are expected to be minor and groundwater withdrawal at the facility would be below the rooting zone of plants.

Wildlife. As discussed above, the combined construction activities for the proposed PFSF and rail line would disturb approximately 408 ha (1,008 acres) of desert shrub/saltbush wildlife habitat. This disturbance would reduce habitats for wildlife species such as jack rabbits, small mammals, and birds. Certain species such as mule deer and pronghorn antelope might be forced to change their movement patterns due to the installation of fencing around the proposed PFSF and the elevated rail bed along the Skunk Ridge rail corridor.

During construction, wildlife, such as ground squirrels, kangaroo mice, pocket gophers, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as gophers and burrowing owl. This reduction of animals and wildlife habitat would have a small negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. However, the loss of wildlife habitat due to clearing is expected to have only a small adverse impact because less than 0.4 percent of existing Skull Valley habitat would be disturbed by the combined construction activities of the proposed facility and rail line.

As noted above, there are no permanent streams on the site of the proposed PFSF, and the proposed Skunk Ridge rail line would cross 32 ephemeral streams (Section 2.1.1.3). These seasonally wet areas are important to many wildlife species, including pronghorn antelope and mule deer. Following BLM and STB BMPs would be expected to result in only small impacts to these streams.

The operation of the proposed PFSF project would result in a number of potential impacts to wildlife. Roaming animals may need to adjust their movements and migration patterns from time to time due to the increased traffic in the area. The Skunk Ridge rail corridor would bisect areas between the western side of Skull Valley and the Cedar Mountains, and potentially affect the movement of wildlife across this area. While both pronghorn antelope and mule deer use these areas for habitat during winter, no critical wintering or fawning areas for these species are known to occur along this route. Impacts of the rail corridor on movement of wildlife are expected to be small, however, assuming BLM guidance is followed to provide adequate crossings of the rail line.

During operation, wildlife could be attracted to the casks, buildings, landscaping plants and trees, power lines and poles, and light posts of the proposed PFSF. Birds, mammals, and reptiles may be attracted to the cask storage area in the winter, as this area will be warmer than the ambient air. Birds may use the proposed PFSF structures, such as the storage casks, for perching and potential nesting because of the limited perching and nesting sites now available in the vicinity of the proposed site. Although perching or nesting on or in the immediate vicinity of the storage casks could result in exposure of birds and small mammals to radiation (Section 4.4.2), given the radiation doses at the surface of the casks and implementation of appropriate mitigation, including a rigorous monitoring plan to discourage animals from remaining in the vicinity of the casks for any significant period should result in only small impacts to wildlife populations.

The possibility of increased fire frequency resulting from operation of the rail line could result in some increased mortality for wildlife species that are not very mobile (i.e., small mammals and certain nesting birds). As discussed in the previous section, planting of crested wheatgrass and native species along the rail corridor would reduce the frequency of fires, and thus reduce any impacts on susceptible wildlife species. Because the frequency of wildfires is not expected to increase significantly above current levels, the impacts to small mammals and those species dependent on small mammal prey species are expected to be small.

Wetlands. The impacts to wetlands from construction of the proposed PFSF are anticipated to be small because there are no wetlands on or near the proposed PFSF or in the vicinity of the rail line and siding. The only potential impact to wetlands would be from increased recreational use of the area in the northern part of Skull Valley around Horseshoe Springs, and it should be small.

Perennial and ephemeral streams. Construction of the proposed PFSF and rail line would have only a small impact on streams. Because there are no surface water flows in the vicinity of the proposed PFSF, no impacts to streams would occur. The proposed Skunk Ridge rail corridor would cross 32 ephemeral streams (Section 2.1.1.3). Depending upon the time of year that rail construction occurs, disturbed soils entrained by these ephemeral desert washes could create minor short-term increases in the turbidity of any water in such streams. However, these impacts on streams are expected to be small because best management practices would be used to control and limit soil erosion during construction.

Threatened and endangered species and other species of concern. No Federally listed or State-listed threatened or endangered plant species are known to be present in the vicinity of the proposed PFSF, rail line, and rail siding. Pohl's milkvetch, a State species of concern, could be present in the area of the Hickman Knolls Pit located about 9.5 km (6 miles) west of the proposed PFSF site. Pohl's milkvetch has been threatened by wildfires and cheatgrass expansions within the greasewood communities in Skull Valley (BLM 1998c). Thus, if wildfires are suppressed near the proposed PFSF, there could be a small positive impact on this species.

Potential impacts to threatened, endangered, and other wildlife species of special concern from the construction and operation of the proposed PFSF include loss of habitat and wildlife species being potentially exposed to radiation. Many raptors potentially present in Skull Valley are State or Federally listed. Another listed predatory bird, the loggerhead shrike, is also found in Skull Valley. Construction activities along the rail corridor could disturb or destroy nesting habitat important to these species. With appropriate mitigation measures (i.e., surveys prior to construction), however, impacts to these species could be avoided or minimized and are thus predicted to be small.

Habitat for mammals, including the BLM-listed kit fox, would be reduced by construction of the Skunk Ridge rail line. This species might also be displaced or forced to change movement or migration patterns. Since the amount of habitat is a very low percentage of the available habitat in Skull Valley, impacts to this fox are predicted to be small. Skull Valley pocket gophers could also be displaced or destroyed as a result of the construction of the rail line. With the implementation of surveys prior to construction, anticipated impacts to these gophers could be avoided or minimized, and would thus be small.

6.1.4.2 Impacts of Alternative 2

Direct and indirect impacts to vegetation from constructing and operating the proposed PFSF at Site B on the Reservation along with the proposed Skunk Ridge rail corridor and rail siding at Low would be similar to those for the proposed action. The Skunk Ridge rail corridor to Site B would require an additional 10 ha (24 acres) of land. Thus, the total area of vegetation that would be cleared under this alternative would be about 418 ha (1,032 acres). This area of disturbance is small relative to the total land area of Skull Valley. About 71 percent of the disturbed area would be revegetated after construction. The type and quality of existing vegetation at Site B and the additional area that would be used for the rail corridor is similar to that at Site A, and no unique or sensitive species or plant communities are known to be present. The impacts to vegetation from this alternative are, therefore, considered to be small.

Impacts to wildlife from constructing and operating the proposed facility at Site B with the rail transportation option would be small because the site and additional area needed for the rail corridor are essentially the same type of habitat as is present on Site A. Because of the longer rail corridor, an additional 10 ha (24 acres) of wildlife habitat would be lost, but there is no unique or sensitive wildlife habitat known to be present on Site B or the additional area needed for the rail corridor. Thus, the impact of this alternative on wildlife is expected to be small.

There are no wetlands, perennial or ephemeral streams, or threatened or endangered plant or animal species known to be present on Site B. Use of the site and area by threatened and endangered species, or species of concern would be similar to use of Site A, and impacts are anticipated to be small with implementation of required mitigation.

6.1.4.3 Impacts of Alternative 3

Impacts of constructing and operating the proposed PFSF at Site A and an ITF near Timpie, and using heavy-haul vehicles to transport SNF from the rail line to the site would be small. Less clearing of vegetation and wildlife habitat would be needed since no rail corridor would be built and existing roads would be used. Therefore, impacts for Alternative 3 would be less than those for Alternative 1. Only 98.5 ha (243 acres) of vegetation and wildlife habitat would be cleared, and about 38 percent [37 ha (92 acres)] of the cleared area would be revegetated. Impacts of constructing and operating the proposed PFSF at Site A on vegetation, wildlife, endangered and threatened species, wetlands, and streams would be identical to those for the proposed action and would be small with implementation of recommended mitigation measures. Under this alternative, the amount of disturbed habitat would be reduced to less than 0.1 percent of land in Skull Valley.

Impacts of constructing and operating the ITF near Timpie would also be small because the 4.5-ha (11-acre) site is already disturbed and does not support any known unique or sensitive vegetation or wildlife habitat. None of the area to be cleared at the ITF near Timpie [4.5 ha (11 acres)] would be revegetated. Construction of the ITF near Timpie is expected to have only a small impact on vegetation because only 4.5 ha (11 acres) would be affected and this area is already disturbed. There are no wetlands or perennial or ephemeral streams near the proposed ITF near Timpie site. No plant species of special concern are known to occur in the area of the ITF near Timpie. The State-listed endangered peregrine falcon is known to have nested a few miles to the east of the ITF near Timpie at the Timpie Springs Waterfowl Management Area, but it is unlikely that these birds use the proposed Timpie site or would be disturbed by construction and operation of the ITF. Thus construction and operation of the ITF would at most cause only a small impact to ecological resources at the proposed ITF or in its immediate vicinity.

6.1.4.4 Impacts of Alternative 4

Constructing and operating the proposed facility at Site B and an ITF near Timpie and using heavy-haul vehicles for transporting SNF from the rail line to the site would have impacts on ecological resources similar to those described for the use of Site A with the ITF because the vegetation and wildlife habitat at Site B are essentially the same as for Site A. Thus, the impacts on ecological resources are anticipated to be small with recommended mitigation measures.

6.1.5 Socioeconomic and Community Resources

As described in Sections 4.5 and 5.5, impacts to the socioeconomic and community resources of the Skull Valley Band and their Reservation are indistinguishable from those to the remainder of Tooele

County with the exceptions of population, land use, and economic structure. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussion as appropriate.

6.1.5.1 Impacts of Alternative 1

Population. The effects of the proposed action on population would be small. As demonstrated in Sections 4.5 (construction and operation of the proposed facility at Site A) and 5.5 (construction and use of the rail line), the total increase in population would amount to approximately 0.6 percent of Tooele County's 1996 population during construction and less than that during operations.

Housing. The effects of the proposed action on housing are small. As demonstrated in Sections 4.5 (construction and operation of the proposed facility at Site A) and 5.5 (construction and use of the rail line), the total increase in housing requirements would amount to approximately 26 percent of vacant housing units for sale or rent in 1990 for Tooele County during construction and approximately one-half that proportion during operations. Even if all in-moving workers decided to locate in a single community, which is highly unlikely, the existing housing market is likely to be able to accommodate the demand.

Education. The effects of the proposed action on education are small. As demonstrated in Sections 4.5 (construction and operation of the proposed facility at Site A) and 5.5 (construction and use of the rail line), the total increase in school-age children would amount to approximately 0.5 percent of existing enrollment in 1997 for Tooele County during construction and somewhat less than that during operations. This increase would not place a substantial burden on the local school system.

Utilities. The effects of the proposed action on utilities are small. There may be some improvement to electrical service if upgrades are required for the proposed facility. The small number of in-moving workers would likely live in existing housing that would not require additional utility hookups during construction and operations.

Solid and sanitary waste. The effects of the proposed action on the management of solid wastes are small. The actual quantities of solid wastes expected to be generated would be small during both construction and operation of the proposed PFSF site and rail line and would be shipped to licensed landfills or to permitted low-level waste facilities, as appropriate. Spoils resulting from construction of the proposed facility and the proposed rail line would be reapplied for grading purposes, and vegetative wastes along the proposed rail line would be shredded and scattered in place.

Transportation and traffic. The temporary effects of the proposed action on transportation are moderate to large. The period of greatest traffic impact would occur during the first period of the first phase of constructing the proposed facility (the first 6 to 8 weeks), when traffic delays along Skull Valley Road may result due to a 172 percent increase in use of the road for the movement of construction materials and workers. The contribution to adverse transportation impacts resulting from construction of the proposed rail siding and rail line would be minimal (accounting for only a 4.5 percent increase in traffic along Interstate 80) and would be spatially separate from impacts along Skull Valley Road. Consideration should be given to the avoidance or amelioration of these impacts by appropriate scheduling of the proposed PFSF related traffic. Impacts during operation of the proposed PFSF and use of the rail line for the movement of SNF would be substantially less.

Land use. The effects of the proposed action on land use are small to moderate. Impacts to land use for construction of the proposed facility would be expected to be quantitatively small (since a small proportion of the total land of the Reservation and an even smaller proportion of land within Skull Valley would be altered), even if the change would be qualitatively different. Construction of the proposed rail line, however, could result in reduced availability of grazing resources, including access to livestock watering resources, during both construction and more particularly during operation. Impacts to land use are not considered to be additive for the proposed facility and the proposed rail line since they are geographically distinct. The indirect impacts (i.e., the impacts generated by in-moving workers) of both the proposed facility and the proposed rail line construction and use would be expected to be small.

Economic structure. The effects of the proposed action on the local economic structure would be beneficial and small to moderate in magnitude. Constructing the proposed PFSF and the proposed rail line would directly result in approximately 255 jobs during the peak of construction, and many of these jobs are likely to be filled by workers from Tooele County or from other counties within commuting distance. The peak construction period may last only a few months, at which point fewer workers would be required. The labor market available in Tooele County and other counties within commuting distance is capable of supplying most if not all of these positions.

In addition to jobs, it is expected that construction and operation of the proposed facility would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. Also, there would be a large benefit to the Skull Valley Band in the form of lease payments for the duration of the proposed facility's operation.

6.1.5.2 Impacts of Alternative 2

Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the proposed rail line would be identical to those described above for the proposed action. Consequently, the combined impacts to socioeconomic and community resources for this alternative are considered similar, if not identical, to those identified for the proposed action.

6.1.5.3 Impacts of Alternative 3

Population. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed facility at Site A by heavy-haul tractor trailer along Skull Valley Road on population are small. As demonstrated in Sections 4.5 (construction and operation of the proposed facility at Site A) and 5.5 (construction and use of the ITF/heavy-haul local transportation option), the total increase in population would amount to approximately 0.4 percent of Tooele County's 1996 population during construction and less than that during operations.

Housing. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on housing are small. As demonstrated in Sections 4.5 (construction and operation of the proposed facility at Site A) and 5.5 (construction and use of the ITF/heavy-haul local transportation option), the total increase in housing requirements would amount to approximately 17.2 percent of vacant housing units for sale or rent in 1990 for Tooele County during construction and approximately three-fourths that proportion during operations. Even if all in-moving workers decided to locate in a single community, which is highly unlikely, the existing housing market is likely to be able to accommodate the demand.

Education. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed facility at Site A by heavy-haul tractor trailer along Skull Valley Road on education are small. As demonstrated in Sections 4.5 (construction and operation of the proposed facility at Site A) and 5.5 (construction and use of the ITF/heavy-haul local transportation option), the total increase in school-age children would amount to approximately 0.3 percent of existing enrollment in 1997 for Tooele County during construction and somewhat less than that during operations. This increase would not place a substantial burden on the local school system.

Utilities. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed facility at Site A by heavy-haul tractor trailer along Skull Valley Road on utilities are small. There may be some improvement to electrical service if upgrades are required for the proposed facility. The small number of in-moving workers would likely live in existing housing that would not require additional utility hookups during construction and operations.

Solid and sanitary waste. The combined effects of constructing and operating the proposed PFSF at Site A and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on the management of solid wastes are small. The actual quantities of solid wastes expected to be generated would be small during both construction and operation of the proposed site and would be shipped to licensed landfills or to permitted low-level waste facilities, as appropriate. Spoils resulting from construction of the proposed PFSF and the ITF would be reapplied for grading purposes.

Transportation. The combined effects of constructing and operating the proposed PFSF at the proposed site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on transportation are moderate to large. The period of greatest traffic impact would occur during the first period of the first phase of constructing the proposed facility (the first 6 to 8 weeks), when traffic delays along Skull Valley Road may result due to a 172 percent increase in use of the road for the movement of construction materials and workers. The contribution to adverse transportation impacts resulting from construction of the ITF would be minimal (accounting for only a 1.2 percent increase in traffic along Interstate 80) and would largely be spatially separate from impacts along Skull Valley Road. Impacts during operation of the proposed PFSF and use of the ITF and Skull Valley Road for the movement of SNF would be substantially less than during construction, although traffic delays may result along Skull Valley Road during the movement of fabricated steel liners and 2 to 4 shipments per week of SNF storage casks to the proposed PFSF.

Land use. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on land use are small. Impacts to land use for construction of the proposed PFSF would be expected to be quantitatively small (since a small proportion of the total land of the Reservation and an even smaller proportion of land within

Skull Valley would be altered), even if the change would be qualitatively different. Construction of the ITF would have minimal land use impacts since the site had been previously disturbed. Impacts to land use are not considered to be additive for the proposed facility and the ITF since they are geographically separate. The indirect impacts (i.e., the impacts generated by in-moving workers) of both the proposed PFSF and the ITF construction and use of Skull Valley Road for movement of materials, workers, SNF on land use would be expected to be small.

Economic structure. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on the local economic structure would be beneficial and small to moderate in magnitude. Constructing the proposed PFSF and the ITF would result in approximately 165 jobs during the peak of construction, and many of these jobs are likely to be filled by workers from Tooele County or from other counties within commuting distance. The peak construction period may only last a few months, at which point fewer workers would be required. The labor market available in Tooele County and other counties within commuting distance is capable of supplying most if not all of these position.

In addition to jobs, it is expected that construction and operation of the proposed PFSF would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. Also, there would be a large benefit to the Skull Valley Band in the form of lease payments for the duration of the proposed PFSF's operation.

6.1.5.4 Impacts of Alternative 4

Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the ITF and heavy haul transport of SNF along Skull Valley Road would be identical to those described above for the use of Site A with the ITF. Consequently, the combined impacts to socioeconomic and community resources for this alternative are considered similar, if not identical, to those identified for Site A with the ITF.

6.1.6 Cultural Resources

6.1.6.1 Impacts of Alternative 1

The impacts to cultural resources would be small to moderate. Potential impacts at the proposed PFSF site include small impacts to significant cultural resource properties, and require limited mitigation measures. Only the segment of the Hastings Cutoff Trail (42TO1187) intersected by the proposed Skunk Ridge rail line would be directly impacted by construction activities. Cultural resources at the proposed PFSF project area consist of isolated surface artifacts that are expected to be not significant. However, the presence of widely scattered artifacts on the ground surface could indicate a potential for cultural resources to be present below the surface. Cultural resource mitigation measures for the proposed rail line will be included in the MOA resulting from the Section 106 consultation process.

6.1.6.2 Impacts of Alternative 2

In this alternative, the rail line is the same alignment as the proposed action and the proposed PFSF location, Site B, is near to Site A. Based on available cultural resources information, Sites A and B are very similar. Therefore, the potential for impacts to cultural resources would be small to moderate.

6.1.6.3 Impacts of Alternative 3

Construction and operation of the proposed PFSF at Site A would have the same potential for impacts as under the proposed action. Cultural resources identified at the ITF site (see Section 5.6.1.2) have not been evaluated and further inventory and evaluation of these historic features could require additional mitigation, depending on the significance evaluation of these resources. Since no upgrading of the Skull Valley Road is planned, there is no potential for direct impacts to archaeological and historic properties located adjacent to the existing the highway. Therefore, the impacts to cultural resources would be small.

6.1.6.4 Impacts of Alternative 4

Under this alternative, the potential for impacts to cultural resources would be the same as outlined in Section 6.1.6.2 for Site B and the same as Section 6.1.6.3 for the proposed ITF location and the existing Skull Valley Road. Accordingly, the impact to cultural resources for this alternative would be small.

6.1.7 Human Health Impacts

6.1.7.1 Impacts of Alternative 1

Non-radiological impacts. The non-radiological impacts for the proposed action would be small. The estimates of potentially fatal and nonfatal occupational injuries for construction and operation activities would be small for workers. As shown in Table 6.2, the total estimated number of potential fatalities for the construction and decommissioning of the proposed PFSF and rail line would be less than 1 and nonfatal injuries for construction and decommissioning would be 2.3 and 0.32, respectively. Table 6.2 also shows that for normal operations at the proposed PFSF and the rail line, there would be less than 1 expected potential fatality and around 6 nonfatal injuries.

Radiological impacts. The radiological impacts from the proposed action are small. The estimates of radiation doses to the general public for operation of the proposed PFSF (see Section 4.7) and transportation using the Skunk Ridge rail line (see Section 5.7) would be small. Operation of the proposed PFSF and transportation of SNF via the Skunk Ridge rail line would result in exposing the general public and workers to small amounts of radiation. None of the estimates of annual radiological dose to members of the public exceed a small fraction of 1 percent of the radiation doses that members of the general public would likely receive from natural background radiation in the United States. The risk from accidents at the proposed PFSF or during transport of the SNF are considered to be small.

Table 6.2. Estimated fatal and nonfatal occupational injuries for the construction, normal operations, and decommissioning activities at the proposed PFSF and the Skunk Ridge rail line

Activity	Estimated potentially fatal injuries	Estimated potentially nonfatal injuries
Construction		
Phase 1	0.07	0.20
Phase 2	0.062	1.0
Phase 3	0.062	1.0
Rail line	0.005	0.10
Construction total	0.20	2.3
Operations		
PFSF	0.37	4.52
Rail line	0.0023	1.52
Operations total	0.37	6.0
Decommissioning		
PFSF	0.07	0.20
Rail line	0.021	0.12
Decommissioning total	0.09	0.32

Note: Operations include 20 years of operations to load the storage area and 20 years of operations to empty the storage area.

6.1.7.2 Impacts of Alternative 2

Non-radiological impacts. The non-radiological impacts from using Site B with the rail line would be identical to those presented above for the proposed action.

Radiological impacts. The radiological impacts from using Site B with the Skunk Ridge rail line would be indistinguishable from those of the proposed action. While Site B is 800 m (0.5 mile) closer to the nearest resident than Site A, the estimated doses at this location would be small and would be indistinguishable from those at Site A.

6.1.7.3 Impacts of Alternative 3

Non-radiological impacts. The non-radiological impacts of using Site A with the ITF would be small. The estimates for this alternative of potentially fatal and nonfatal occupational injuries for construction, operation, and decommissioning activities would be small for workers. As shown in Table 6.3, the total number of estimated fatalities for construction and decommissioning of the proposed PFSF and ITF would be less than 1 and nonfatal injuries for the construction and decommissioning would be 2.3 and 0.30. Table 6.3 also shows that there would be less than

1 fatality and around 9 nonfatal injuries total at the proposed PFSF and the ITF for normal operations.

Table 6.3. Estimated fatal and nonfatal occupational injuries for the construction, normal operations, and decommissioning activities at the proposed PFSF and the ITF

Activity	Estimated potentially fatal injuries	Estimated potentially nonfatal injuries
Construction		
Phase 1	0.07	0.20
Phase 2	0.062	1.0
Phase 3	0.062	1.0
ITF	0.005	0.10
Construction total	0.20	2.3
Operations		
PFSF	0.37	4.52
ITF	0.034	4.52
Operations total	0.40	9.0
Decommissioning		
PFSF	0.07	0.20
ITF	0.005	0.10
Decommissioning total	0.075	0.30

Note: Operations include 20 years of operations to load the storage area and 20 years of operations to empty the storage area.

Radiological impacts. The radiological impacts from using Site A with the ITF would be small to moderate. The estimates of radiation doses to the general public for operation of the proposed PFSF (see Section 4.7) and transportation using the ITF (see Section 5.7) would be small. However, this alternative could result in exposing the workers to amounts of radiation in excess of NRC occupational exposure limits. Workers involved with transporting SNF from railcars to heavy haul vehicles would also perform category 1 and 2 tasks at the proposed PFSF. The total annual person-rem for these work activities assuming transfer of 200 casks per year is 0.646 person-Sv (64.6 person-rem) [i.e., 0.49 person-Sv (49 person-rem) for unloading casks at the proposed PFSF; 0.037 person-Sv (3.7 person-rem) for maintenance and inspection at the proposed PFSF; 0.119 person-Sv (11.9 person-rem) for handling at the ITF]. Considering that PFS has indicated that only 12–15 workers would be involved in these activities, this could result in individual workers receiving 0.053 Sv (5.3 rem) to 0.0431 Sv (4.31 rem) annually. Therefore, for this alternative, PFS would be required to take additional measures to ensure that its workers receive no more than 0.05 Sv (5 rem) per year, pursuant to 10 CFR Part 20 limits for occupational exposure.

None of the estimates of annual radiological doses to members of the public exceed a small fraction of 1 percent of the radiation doses members of the general public would likely receive from natural background radiation. The risk from accidents at the proposed PFSF or during transport of the SNF are considered to be small.

6.1.7.4 Impacts of Alternative 4

Non-radiological impacts. The non-radiological impacts from using Site B with the ITF would be identical to those presented above for the use of Site A and the ITF.

Radiological impacts. The radiological impacts from using Site B with the ITF would be indistinguishable from those of using Site A with the ITF. While Site B is approximately 1.6 km (1 mile) further from the ITF and 800 m (0.5 mile) closer to the nearest resident than Site A, the estimated additional doses to the public along the short extra length of Skull Valley Road, as well as the slightly larger dose to the nearest resident, would be small and would be virtually indistinguishable from the doses at Site A.

6.1.8 Other Impacts

6.1.8.1 Noise

Impacts of Alternative 1. Sounds from storage facility construction would not be audible along most of the rail line, and vice-versa, due to the large distances between them. When rail-line construction would occur close to the storage facility, noise would not be additive because combined noises are dominated by the loudest source. Several proximate noise sources would not be expected to add more than about 3 decibels to the noise of the loudest source. These concepts also apply to site operation, when the delivery locomotive, switch engine, emergency generator, and a few vehicles might all be operating simultaneously. In this case, the combined noises are unlikely to be more than about 3 decibels greater than the loudest source, which would be the diesel switch engine whistle.

Impacts of Alternative 2. Noise impacts would be difficult to distinguish from Site A with a rail line. Noise from construction would be expected to last about 3 percent longer because the additional construction would be expected to take more time. Also, the delivery locomotive would generate noise over an additional 3 percent distance (and, presumably, for 3 percent more time) each time a delivery is made.

Impacts of Alternative 3. Sounds from construction at the storage facility would not be audible at the ITF facility, and vice-versa, due to the large distance between those sites. In any case, as noted above, noise from proximate sources tends to be dominated by the loudest source. Delivery vehicles would likely dominate the noise at the storage facility, which would otherwise be relatively quiet. An ITF facility would obviate the use of train transport, and the unlikely possibility of a train whistle on very rare occasions. However, SNF heavy-haul vehicles on Skull Valley Road would add noticeable noise which could sometimes be distracting to residents along the route.

Impacts of Alternative 4. Noise impacts of Site B with the ITF would be difficult to distinguish from Site A with an ITF. Heavy-haul vehicles would generate noise over an additional 3 percent distance (and, presumably, for 3 percent more time) each time a delivery of SNF is made to the proposed PFSF.

6.1.8.2 Scenic Qualities

Impacts of Alternative 1. Construction and operation of the proposed PFSF at Site A, when combined with construction and operation of the rail line and siding, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site A, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and moderate impacts to motorists traveling Skull Valley Road. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

Impacts of Alternative 2. Construction and operation of the proposed PFSF at Site B, when combined with construction and operation of the rail line and siding, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. For visual impacts, only minor difference between Site A and Site B is that the new rail line to Site B would have to be 800m (2,600 feet) longer than the line to Site A. The staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site B, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and moderate impacts to motorists traveling Skull Valley Road. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

Impacts of Alternative 3. Construction and operation of the proposed PFSF at Site A, when combined with construction and operation of the ITF, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site A, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and small impacts to motorists traveling Interstate 80. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

Impacts of Alternative 4. Construction and operation of the proposed PFSF at Site B, when combined with construction and operation of the ITF, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site B, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and small impacts to motorists traveling Interstate 80. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

6.1.8.3 Recreation

Impacts of Alternative 1. The combined effects of constructing and operating the proposed facility at the preferred site (Site A) and constructing a new rail siding at Skunk Ridge and a new rail corridor connecting the Skunk Ridge siding with Site A and then transporting SNF to Site A by rail on recreational resources and opportunities are expected to be small. Construction and operation of the proposed PFSF and rail line would not prevent access to recreational resources, but these activities are likely to result in some delays or inconvenience to users wishing to access recreational resources and opportunities, particularly during construction, when (1) access to these resources in Skull Valley would be adversely affected by the movement of construction materials and workers on Skull Valley Road (i.e., for construction of the proposed facility) and (2) access to resources west of the proposed rail line would be affected by rail line construction. Since access to recreational resources west of the proposed rail line must be made by way of Skull Valley Road, these particular impacts are additive. During the later phases of construction and during the operations period, impacts to recreational resources and opportunities should be smaller (i.e., with much less traffic along Skull Valley Road), although there may continue to be some continuing difficulty in accessing resources west of the proposed rail line. Construction and operations of the proposed facility and rail line should result in small indirect impacts to recreational resources and opportunities.

Impacts of Alternative 2. Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the proposed rail line are identical to those described in Section 6.1.8.3 for the proposed action. Consequently, the combined impacts to socioeconomic and community resources for this alternative are considered similar to those identified for the proposed action.

Impacts of Alternative 3. The combined effects of constructing and operating the proposed PFSF and a ITF near Timpie are expected to be small. The impacts due to construction and operation or use of the ITF and shipment of SNF by heavy-haul tractor trailer along Skull Valley Road to recreational resources and opportunities are expected to be almost non-existent during construction (since the site of the ITF is close to Interstate 80 and is not expected to affect recreational resources) and should result in delays for users traveling along Skull Valley Road to access recreational resources and opportunities in Skull Valley during operations. Consequently, the combined impacts to recreational resources and opportunities for this alternative are considered to be small during construction and even smaller during operations.

Impacts of Alternative 4. Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the ITF and heavy haul transport of SNF along Skull Valley Road are identical to those described above for the use of Site A with the ITF. Consequently, the combined impacts to recreational resources and opportunities for this alternative are considered similar to those identified for Site A with the ITF and would be small.

6.2 Environmental Justice

Executive Order 12898 (59 Fed. Reg. 7629) directs Federal executive agencies to consider environmental justice under NEPA, and CEQ has provided *Guidance for Addressing Environmental Justice Under the National Environmental Policy Act* (December 1997).This Executive Order ensures that minority and low-income groups do not bear a disproportionate share of negative environmental consequences. Although NRC is an independent agency, the Commission has committed to undertake environmental justice reviews and has provided specific information requirements in Nuclear Material Safety and Safeguards (NMSS) Policy and Procedures Letter 1-50, Revision 2, "Environmental Justice in NEPA Documents," September 1999.

This environmental justice review includes an analysis of the human health and environmental impacts on low-income and minority populations resulting from the proposed action and its alternatives. The first step in the review was to analyze demographic data to identify the minority and low-income groups within the area of environmental study. Next, the impacts from the proposed action and its alternatives were evaluated to determine if the impacts disproportionately affected minority and low-income groups in an adverse manner.

For the purposes of this review, "minority" is defined as individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population is one where the minority population exceeds 50 percent or where the minority population of the environmental impact site is significantly greater than the minority population percentage in the geographic area of study. A "low-income" population is defined as one where the percentage of households below the poverty level in an environmental impact site is significantly greater than the low-income population percentage in the geographic area of study. As a general matter (and where appropriate), the NRC staff may consider differences greater than 20 percentage points to be significant (NRC/NMSS 1999). NRC policy (NRC/NMSS 1999) states that when determining the area for impact assessment for a facility located outside the city limits or in a rural area, a 6.4-km (4-mile) radius [or 130 km^2 (50 $miles^2$)] should be used.

Under NMSS procedures, additional census blocks groups may be identified by relaxing these criteria if local circumstances appear to warrant. In the current situation, the State of Utah has very low percentages of minority populations, and rural areas in the State tend to have sparsely-populated large block groups. In addition, the analysis examines transportation routes into the proposed PFSF site. As a result of the proposed action being examined and the local circumstances, the area for impact assessment was expanded to an 80 km (50 miles) radius to examine local transportation routes into the facility. The percentage criterion was left at 20 percentage points; however, the staff also examined a 10 percentage point difference to see if additional relatively small pockets of low income and minority residences could be identified. In addition, the portion of the proposed rail routes beyond the 80 km (50 mile) radius impact assessment area but within the State of Utah were also examined to determine if any minority and low-income populations exist along these routes.

Usually, a minority population would be one with a minority percentage of 50 percent or a percentage 20 percentage points greater than in the geographic area of study (usually the State and counties that include the environmental impact site) because the percentage of minorities in the county is nearly identical to the percentage of minorities in the State. For example, for the State of Utah, the Native American population is 1.4 percent, and the total minority population is 8.71 percent. Therefore, a census block group within the impact assessment area with a Native American population of at least 21.4 percent or with a minority population of at least 28.7 percent would count as a minority population worthy of further study. A similar analysis is conducted for the low income population.

In some cases, minority and low-income groups may rely on environmental resources for their subsistence and other cultural practices. Therefore, NMSS guidance also specifies that the staff make inquiries regarding special resource uses or dependencies of identified minority and low-income populations, including cultural practices and customs, previous environmental impacts and features of previous and current health and economic status of the identified groups. In some circumstances, these groups might be unusually vulnerable to impacts from the proposed action.

Potential resource dependencies were identified in the course of public meetings and other information supplied by the Skull Valley Band, by Ohngo Gaudadeh Devia (an organization representing part of the Skull Valley Band), and by the Confederated Tribes of the Goshute Reservation, who are relatives of the Skull Valley Band, but reside on another Reservation on the Nevada-Utah border near Wendover, Utah. Also, the cooperating agencies sent letters to several local Federally recognized Indian Tribes describing the proposed construction and operation of the Skunk Ridge rail line, and to solicit their concerns on the project and to inquire about whether they desired to participate in the Section 106 consultation process (see Appendix B). Only the Confederated Tribes of the Goshute Reservation has responded. Inquiries also were made by PFS to the State of Utah concerning health status of the Skull Valley Band, and the staff made additional inquiries to the Indian Health Service. The results are described below.

6.2.1 Impacts of Alternative 1

The staff examined the geographic distribution of minority and low income populations within 50 miles of the proposed PFSF and along principal rail routes within the State of Utah, based on 1990 U.S. Census data, supplemented by field inquiries by PFS to the local planning departments in Tooele and Salt Lake Counties and social service agencies in the State. The record of public comment was also reviewed to see if any groups were missed.

6.2.1.1 Demographics

Minority populations. The significant minority populations near the proposed PFSF are members of the Skull Valley Band, both on the Reservation and in the nearby town of Grantsville. There is a combined non-Reservation population of about 120 Skull Valley Band members, most of whom reside in outlying communities such as Grantsville and Salt Lake City. The Reservation population is approximately 30 persons, most of whom are Skull Valley Band members; however, some non-members, such as spouses, also live on the Reservation (see Section 3.5.1). Figure 6.1 illustrates the geographic distribution of census block groups meeting the 20 percentage point criterion for minority populations in the 1990 U.S. census within 80 km (50 miles) of the proposed PFSF. In the figure, the block group surrounding the proposed PFSF site (shaded) and 5 block groups in Salt Lake City (shaded and circled) meet the 20-percentage point criterion. Table 6.4 shows the percentages of the various minority populations for each census block group within 80 km (50 miles) that satisfies the criteria used for this analysis. A table that shows the minority and low-income percentages for each census block group within 80 km (50 miles) of the proposed PFSF is shown in Appendix E. In the table, the census block groups meeting the 20 percentage point criterion are in boldface, and the additional block groups meeting the 10 percentage point criterion are in italics. It should be noted that for this analysis, the State was used as the area of geographic study. Therefore, the minority and low-income populations were based on a comparison to the State averages. The county averages nearest the proposed project (e.g., Tooele, Salt Lake) have minority and low-income populations similar to the State of Utah. Relaxing the criteria would expand the

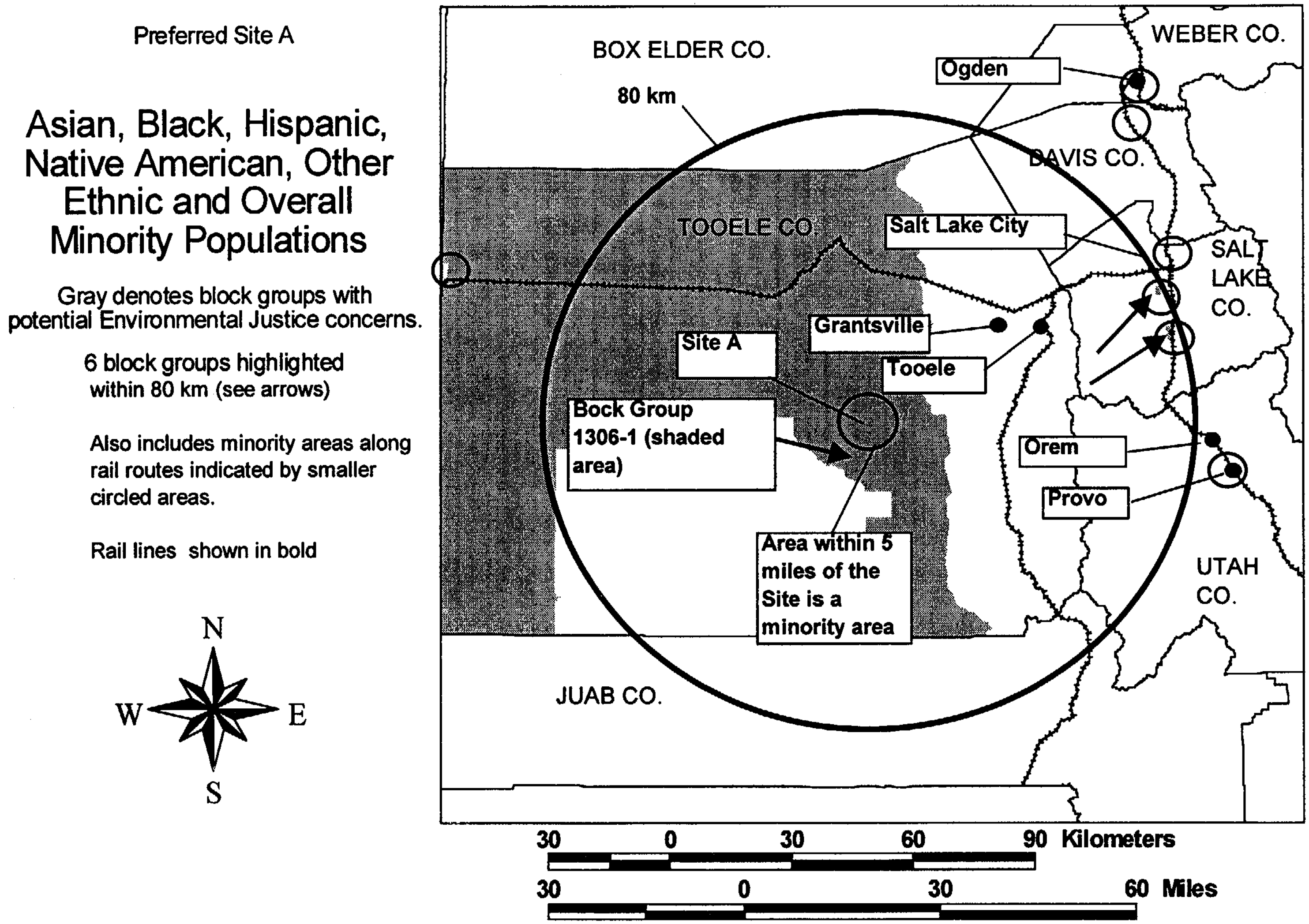


Figure 6.1. Geographic distribution of minority census block groups near the proposed PFSF site in Skull Valley.

Table 6.4. Minority and low income block groups within 80 km (50 miles) of the preferred site

County and tract	Block group	Persons	Below poverty level (percent)	Total whites (percent)	Black (percent)	Native American (percent)	Asian and Pacific Islander (percent)	Other (percent)	Hispanic (all races) (percent)	Minorities (racial minorities plus white hispanics) (percent)
State of Utah		1,722,850	11.4	93.9	0.6	1.4	1.9	2.1	4.8	8.7
Threshold for environmental justice concerns		—	31.4	—	20.6	21.4	21.9	22.1	24.8	28.7
Utah										
0106	1	1,151	19.0	85.8	0.0	1.7	0.3	*12.3*	*16.2*	16.7
Tooele										
1306	1	338	15.0	72.8	0.0	**23.1**	1.8	2.4	6.2	*28.2*
1310	1	1,390	8.1	94.8	0.4	1.4	0.4	2.9	13.8	*20.0*
1310	3	797	16.8	89.6	0.8	1.1	1.9	6.6	*16.4*	*20.5*
1310	4	898	*24.7*	86.5	0.3	1.4	0.4	11.2	*16.4*	18.3
Salt Lake										
1028	4	2,715	16.7	71.1	4.6	1.7	*13.6*	9.0	*17.0*	**37.7**
1116	6	1,200	**35.5**	91.3	0.8	1.3	3.3	3.2	7.3	10.8
1121	1	784	*24.7*	94.9	0.3	2.4	1.3	1.1	9.2	*21.3*
112401	3	613	13.8	68.2	0.3	2.6	2.9	**25.9**	**37.4**	**50.2**
112401	4	1,657	**36.3**	82.6	0.7	3.2	2.3	11.2	**26.0**	**29.0**
112401	5	995	**52.0**	70.8	1.0	2.9	9.2	*16.1*	**31.9**	**51.6**
112402	3	2,218	15.8	87.4	0.1	0.2	7.8	4.5	10.1	*18.9*
112801	4	3,311	0.5	82.5	6.6	2.4	1.5	7.0	*14.8*	*25.7*
112908	4	1,219	**31.8**	91.4	0.4	0.5	4.4	3.3	9.8	11.8
112908	5	828	8.6	91.8	0.0	0.2	2.9	5.1	11.7	*19.4*
1131	5	1,233	*24.3*	98.3	0.4	0.5	0.1	0.7	2.6	3.5
113304	2	882	**32.0**	87.9	1.2	1.7	2.3	6.9	12.2	14.1
113304	5	1,778	**31.5**	84.1	1.3	2.5	7.5	4.6	8.5	*21.1*
113305	1	1,397	*23.1*	83.7	3.3	2.3	4.9	5.8	13.1	*21.8*
113305	3	1,174	**53.7**	57.4	0.8	10.7	**26.0**	5.1	7.8	**46.5**
113306	1	1,855	*23.0*	85.3	3.3	1.2	5.0	5.2	9.6	*20.6*
113307	2	1,469	*21.9*	84.9	0.9	1.6	7.6	5.0	8.2	17.8
113308	1	974	*23.6*	83.8	1.4	4.0	3.6	7.2	11.9	*20.9*
113308	3	1,263	*25.5*	87.6	0.9	3.4	6.1	2.0	9.5	18.2
113405	1	2,763	4.7	81.0	1.0	0.8	*13.0*	4.2	7.5	*22.8*
113406	2	1,926	21.2	84.5	0.9	1.8	7.9	4.8	8.7	*21.0*
113407	2	699	19.6	90.4	0.3	1.0	1.9	6.4	12.4	*23.9*
113519	4	1,552	*23.3*	91.3	1.5	1.0	1.3	4.8	10.4	14.2
113802	2	1,476	17.6	93.4	0.8	0.3	2.0	3.5	13.1	*19.7*
113901	3	1,636	**31.7**	90.6	0.9	0.4	2.8	5.3	*15.6*	*23.4*
Juab										
9732	2	191	20.7	73.8	0.0	*18.8*	0.0	7.3	7.9	*26.2*

number of block groups counted as minority block groups within 80 km (50 miles) from 6 to 18, but would not significantly change the picture of their location. These additional block groups tend to be near those in Salt Lake City already identified using the 20-percentage point criterion. Most of Skull Valley is in a single block group (Tract 1306, Block Group 1), and it is the only block group within about 6 km (4 miles) of the proposed PFSF facility.[1] It is a minority block group.

[1]PFS indicates that about 83 percent of persons living within 5 miles of the preferred site are minorities (PFS/ER 2000).

There is a small Native American population in north-central Salt Lake City. A few block groups in the north and central parts of Salt Lake City, in the central Ogden area and between Ogden and Salt Lake City in the general vicinity of Clinton, West Point, and Clear Field, are near the proposed rail routes and met the criteria used for this analysis to determine a minority population.

Hispanics are Tooele County's principal minority group, with 2960 individuals. There is a Hispanic community in Tooele that does not rise to the 20 percent criterion used for this analysis to determine a minority population (Tract 1310 has three block groups in which the number of Hispanics as a percent of population exceeds that for the state as a whole by 10 percent or more). Hispanic populations in west and northwest Salt Lake City satisfy the 20 percent criterion. In north Salt Lake County beyond 80 km (50 miles) from the proposed PFSF, there are about a dozen block groups that satisfy the minority and low income criteria and are near the principal rail route. Also, there are concentrations of Hispanics and other minorities in Davis and Weber Counties beyond 80 km (50 miles) from the proposed PFSF site. Weber County (Ogden and vicinity) has several block groups that have majority or near-majority Hispanic populations. In some cases, these block groups appear to be within a mile of the main rail corridors to the proposed PFSF site.

Beyond 80 km (50 miles) from the proposed PFSF, one block group in Davis County showed almost 27 percent black (76 percent minorities), and two in Salt Lake County and one in Davis county were over 25 percent Asian. These communities are near the proposed rail routes. No other significant minority populations were identified in any census block group either close to the proposed PFSF site or along the proposed transportation corridors into the site. This indicates that other minority populations are either well-mixed into the majority population, or other minority populations are too small to be captured in the census detail.

In summary, 6 block groups within 80 km (50 miles) of the proposed PFSF were identified to satisfy the criteria used in this analysis to define a minority population. The minority population nearest to the proposed site is the Skull Valley Band living on the Reservation. As a result, the impacts on this group were analyzed to determine if a disproportionate high and adverse impact would occur from construction and operation of the proposed PFSF.

Six minority block groups within 80 km (50 miles) of the proposed PFSF and 45 minority block groups within the State of Utah, but beyond 80 km (50 miles) from the proposed PFSF site were identified to live near the proposed transportation routes (i.e., rail routes). Because minority and low income populations living near these rail routes would likely have more SNF shipments pass them, the impacts to these populations were analyzed to determine if a disproportionate high and adverse impact occurred from the transportation of SNF to the proposed PFSF.

Low-income populations. Figure 6.2 shows the distribution of low-income populations for several counties in the State of Utah, and includes the environmental study area out to 80 km (50 miles) from the proposed PFSF site. The figure identifies the general location of 8 block groups meeting the 20 percentage point criterion. Detailed information on individual block groups within 80 km (50 miles) that satisfy the criteria used for this analysis is shown in Table 6.4 (block groups that meet the 20 percentage point criterion are in boldface and those meeting the 10 percentage point sensitivity criterion are in italics). Neither the Skull Valley block group nor Tooele County as a whole would be identified as a low-income population by the NMSS criteria. Of the 320 persons in the Skull Valley block group, only 15 were counted as below the poverty line in 1990. Recent inquiries by PFS indicate that this number may now be "about 17." These may disproportionately include residents of

Preferred Site A

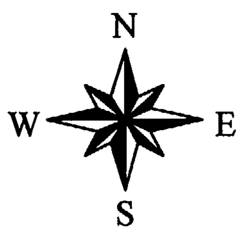
Low-Income Populations

Gray denotes block groups with potential Environmental Justice concerns.

8 block groups highlighted within 80 km (see arrows)

Also includes low-income areas along rail routes indicated by smaller circled areas.

Rail lines in bold



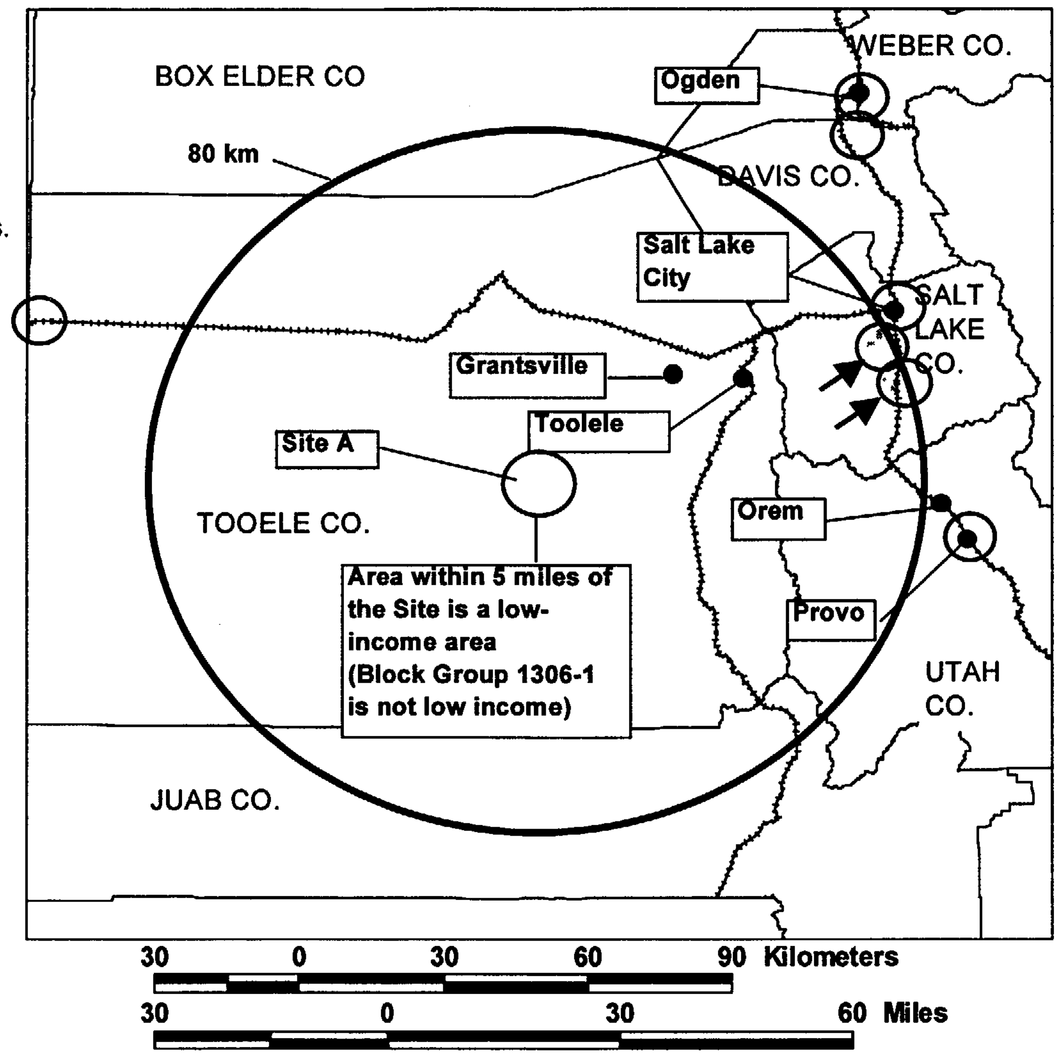


Figure 6.2. Geographic distribution of low-income census block groups near the proposed PFSF site in Skull Valley.

the Reservation, but the census data do not provide this information (see Section 3.5.1). PFS indicates that over 61 percent of the people within 5 miles of the preferred site (Site A) are low income (PFS/ER 2000). The concentration of low-income populations is slightly elevated in Grantsville, Tooele, and south/southeast Tooele County but does not satisfy the 20 percentage point criterion used for this analysis. The main low-income areas within 80 km (50 miles) of the proposed PFSF are located, as shown in Figure 6.2, in central and northern Salt Lake County, within a mile or two of the principal rail corridor. Beyond 80 km (50 miles) of the proposed PFSF, the principal low-income areas appear to correspond closely with the minority communities in Weber (Ogden) and in Salt Lake and Davis Counties near the rail line. In addition, there are a few non-minority low-income block groups near the rail in the Provo-Orem area, which may, in part, reflect the presence of the student population of Brigham Young University. In summary, the nearest low-income groups in the region include populations within 6.4 km (4 miles) of the site, including individuals living on the Reservation, in Grantsville, Tooele, the south/southeast portion of Tooele County, and near the rail line.

6.2.1.2 Assessment of Impacts

For each of the areas of technical analysis presented in this DEIS, a review of impacts to the human and natural environment was conducted to determine if any minority populations or low-income populations could be subject to disproportionately high and adverse impacts from the proposed action. The review includes potential impacts from the construction and operation of the proposed PFSF and the Skunk Ridge rail line.

Through the scoping process, affected representatives of the Skull Valley Band and neighboring Indian Tribes expressed their concerns with the project and identified how they perceived how the construction and operation of the proposed PFSF and Skunk Ridge rail line would affect them. These discussions elicited a concern that adverse impacts to the portion of the Reservation that would be used for the proposed PFSF, and nearby tribal trust and BLM lands could also affect the cultural values of the Skull Valley Band and other Native Americans. The impacts identified involved disturbance, destruction, or limitations of services from ecological and biological resources, altered land forms; and a noise or visual impact to sacred sites. The level of impact to cultural values associated with natural resources would be dependent on the cultural values associated with the land disturbed under each of the alternatives. Specific concerns are as follows:

- Potential loss of property values for houses owned by Tribal members
- Potential groundwater conflicts with wells supplying water to Tribal members
- Potential loss of opportunity to collect, or potential airborne or waterborne contamination of, plant and animal resources near the proposed PFSF site (no plant and animal resources appear to be collected on the land that would be inside the proposed PFSF outer fence)
- Potential contamination (probably airborne, given the locations involved) of sacred burial sites within 0.8 km (0.5 mile) of the Skull Valley Band village.

For each area of analyses, impacts were reviewed to determine if any potential adverse impacts to the surrounding population would occur because of SNF transport, construction, normal operations, or accident conditions. If potential adverse impacts were identified, a determination was made as to whether minority or low-income populations would be disproportionately affected. Table 6.5 presents a summary of the potential impacts to low-income and minority populations, without considering any mitigation actions.

Table 6.5. Potential impacts of the proposed action on minority and low-income populations

Potential impact[a]	Potentially affected minority population or low income community	Level of impact
Geology, minerals, and soils	Skull Valley Band	Small
Water Resources	Skull Valley Band	Small
Air quality	Skull Valley Band	Small
Ecology	Skull Valley Band	Small
Socioeconomic and community resources Land use Employment Population Housing values	Skull Valley Band	Small to moderate moderate (but beneficial)
Economic structure Traffic	Skull Valley Band; other Federally Recognized Indian Tribes	Moderate to large (and beneficial) moderate to large
Cultural resources	Skull Valley Band	Small to moderate
Human health Radiological Non-radiological	Skull Valley Band, low income and minority populations near proposed rail routes	Small
Noise	Skull Valley Band	Small to moderate
Scenic qualities	Skull Valley Band	Moderate
Recreation	Skull Valley Band	Small

[a]All other potential impacts were small and not disproportionate.

Adverse impacts are defined as negative changes to the existing conditions in the physical environment (e.g., land, air, water, wildlife, vegetation, human health, etc.) or negative socioeconomic changes. Disproportionate impacts are defined as impacts that may affect minority or low-income populations at levels appreciably greater than effects on non-minority or non-low-income populations. The cooperating agencies conclude that no disproportionately high and adverse impacts will occur to the Skull Valley Band or to minority and low income populations living near the proposed rail routes from the proposed action.

Impacts to the geology, minerals, soils; water resource; air quality; and ecology from the proposed action. Land distances and changes to land forms could result from such activities as the construction of roads and buildings at the proposed PFSF site. Fugitive dust emissions from such activities, if not properly controlled, may also be an issue at the nearest residences, which are Skull

Valley Band-owned. These impacts are most likely to occur where most construction activity is likely to take place, in and around the proposed PFSF site and along the rail corridor into the site. The impacts are most likely to be seen from Skull Valley road, Hickman Knolls, the Stansbury Mountains to the east of the site, and the Cedar Mountains to the west of the proposed PFSF. Some of these locations are sacred sites of the Skull Valley Band. Noise and dust associated with the construction and operation of the proposed PFSF are not expected to affect the nearest residents (Section 4.8), would only slightly and temporarily affect wildlife (Section 4.4), and would likely have small, if any, potential to impact the Stansbury Mountains, Cedar Mountains, or Hickman Knolls. Vegetation and wildlife are expected to be affected only within the 330 ha (820 acre) OCA, the access road, and rail corridor. The impacts to these areas are not expected to be significant (see Sections 4.4 and 5.4). As described in Sections 4.8.2, 5.8.2, and 6.1.8.2, the scenic qualities to members of the Skull Valley Band could be moderately impacted. Mitigation measures are described in Section 4.8.2. A significant increase in traffic on Skull Valley Road would occur during the initial phase of construction (see Section 4.5). This period of inconvenience would be short. Although traffic would increase, all travelers on Skull Valley Road including those workers traveling to Dugway would be affected. Therefore this would not represent a disproportionate impact to minority and low income groups in the area. There are expected to be no groundwater conflicts between the site and the nearest well that belongs to a member of the Skull Valley Band.

Human health impacts at the proposed PFSF. Although minority and possibly low-income populations live relatively near the proposed PFSF site [i.e., within a 5 km (3 mile) radius], including the nearest residence, which is within 3.2 km (2 miles) of the proposed PFSF, it is very unlikely that normal operations would affect them with radiological and non-radiological health impacts and other risks. Even though the nearest resident populations are Goshutes, these risks would most likely be insignificant for any offsite population for any alternative discussed in this DEIS (see Section 4.7). Therefore, it is unlikely that any minority or low-income population would be disproportionately and adversely affected by normal operations of the proposed PFSF.

No credible accident scenarios for the proposed PFSF could be found with potentially significant releases of radionuclides to air or ground that could result in significant affects to any offsite populations. Thus, there is no mechanism for disproportionate environmental effects through accidents on minority residents near the proposed PFSF. Section 4.7 shows that even the most severe hypothetical accident analyzed, which is not credible, an undetected leak, lasting 30 days, would result in exposure of 0.76 mSv (76 mrem) at the nearest offsite boundary. Such an exposure is over 60 times less than the 0.05 Sv (5 rem) exposure limit for accidents in 10 CFR 72.106. An exposure of 0.76 mSv (76 mrem), which is 25 percent of natural background radiation, is not considered a high adverse impact.

Human health impacts from transportation. Based on their location with respect to rail routes through the Salt Lake City and Grantsville areas, some minority and low income populations existing along the rail lines would be affected by radiological exposure due to either routine operations or accidents during transportation of SNF to the proposed PFSF. However, the transportation analysis (Section 5.7) found that the impacts from transporting SNF to the proposed PFSF would be small from normal operations or from accidents. Thus, no disproportionately high and adverse effects are expected for any particular segment of the population, including minority and low-income populations that may exist along the proposed rail routes.

Socioeconomic Impacts. In addition to the socioeconomic impacts discussed in Section 4.5, three additional areas were identified during the scoping process that could adversely and potentially disproportionately impact minority and Native American populations or low-income populations. These impacts include (1) potential increases or decreases in housing values that could adversely impact access to affordable housing by low-income populations; (2) continued restrictions on access to the proposed PFSF site by all individuals;[2] and (3) reduction in the services which the proposed PFSF site provides Native Americans. These types of impacts are addressed in the following paragraphs.

Impacts of housing costs on low-income populations. Current projections (Section 3.5) show that housing prices in Skull Valley and nearby towns are expected to increase steadily from 1997 through 2040 under baseline conditions. Housing prices in Tooele County are expected to increase in part because, as the Salt Lake Valley population increases, Tooele and Grantsville populations and the local workforce with it are expected to continue to increase as well. The baseline conditions used in the impact analysis of the alternatives on the housing market in Tooele County did not assume any increase in low-income housing or rental units or housing cost subsidies and assistance by Federal, State, or local low-income housing agencies or programs. Changes from these baseline conditions or other substantial changes in the Tooele economy could modify the net impact of the alternatives on the housing market. If the housing market in Tooele County does not experience the levels of price increases shown in the EIS, the impact on low-income communities would be correspondingly reduced.

As set forth in Section 4.5, the population in Tooele County is expected to grow, due to the proposed PFSF workforce, by fewer than 100 persons (47 households) who are not members of the Skull Valley Band. Most of these persons are expected to live at Grantsville or Tooele and not on the Reservation. Associated population increases would be minimal, and increased demand for housing over and above the existing demand would be small. The proposed PFSF in and of itself would have minor impacts on housing prices off the Reservation and, when added to the other regional employment impacts, would not adversely impact the access of low-income populations in Grantsville and Tooele to affordable housing.

The Skull Valley housing market is isolated by geography, and part of the valley is also isolated by its Reservation status from the rest of Tooele County. The Reservation itself is not a normal housing market. The only persons who may reside on the Reservation itself are Tribal members, spouses of Tribal members, and their children. The values of existing houses do not include the value of underlying land, which remains in trust to the Skull Valley Band. Housing prices also reflect the strong presence of Federal housing programs. It is not clear whether there is an active housing market on the Reservation.

Impacts on Reservation housing prices would partly depend on whether the proposed PFSF would attract Tribal members back to the Reservation and partly on the financing mechanisms used. If some Skull Valley Band members moved back to the Reservation to take jobs at the proposed PFSF, there might be some increase in demand for housing on the Reservation, but whether returning residents simply build new housing, with no effect on the nominal value of existing homes

[2]Note that access restrictions would apply to both the Skull Valley Band and to members of the Confederated Tribes of the Goshute Indians, some of whom have expressed an interest in access to and unrestricted use of the Reservation. The impacts have been estimated as small, and no mitigation is planned.

is not known. In any case, due to the small number of workers expected to move back to the Reservation, the impact on housing price is expected to be small.

Impacts from restrictions on access to Reservation lands and the transportation corridor. Access to the proposed PFSF site would be restricted once construction begins. Also, land use would change along the preferred transportation corridor through the BLM lands to the north and west of the site, possibly preempting some traditional land uses. Some members of the Skull Valley Band have expressed a desire to have access to and use of the Tribal lands in the vicinity of the proposed PFSF now and in the future. The impacts on access to traditionally used lands and resources are expected to be small, and mitigation is not planned. Restrictions on land access to the west of the rail line could be mitigated by grade crossings, as noted in Section 5.5.

The area of restriction that would result from the construction and operation of the proposed PFSF and rail line are relatively small in size when compared to the overall size of the Reservation and the rest of Skull Valley, and these areas do not contain any known features that are unique to Skull Valley. Access to the rail line would be limited only for areas under construction. Furthermore, only one cultural artifact has been identified in the proposed areas of restriction (see Section 5.6). Therefore, impacts from restricted-access to the proposed PFSF site and any restriction associated with access to the rail corridor is considered to be small.

Positive socioeconomic impacts. The proposed PFSF would provide substantial lease income to the Skull Valley Band and would result in a large positive impact. In addition, the lease requires PFS to provide employment preferences first to members of the Skull Valley Band, second to children of Skull Valley Band members, and third to members of other Federally recognized Indian Tribes. The preferences would be for all positions including skilled technical and management positions, and only to the extent they are in compliance with Federal law. These impacts would be disproportionately beneficial to the Skull Valley Band and other Native Americans.

Cultural resource impacts. Some Skull Valley Band members state that portions of the area near the proposed PFSF site have been used by Native Americans for religious purposes, hunting, and gathering of foods (e.g., deer, wild plants, sage hens, pheasants) and other plant material such as sagebrush and willows. In the scoping meeting, members of the Skull Valley Band stated that the surrounding territory near the proposed PFSF site and the Skunk Ridge rail corridor have been used to gather plants that figure prominently in the traditional practices and religion of the Native Americans. It is quite possible that these resource services which the site provides to the Native Americans could be diminished under proposed action but these resource services are not unique to these areas of Skull Valley and are readily accessible and easily obtainable in the immediate surrounding areas. Therefore, the impacts would be small.

6.2.2 Impacts of Alternative 2

Because of the close proximity of the two Skull Valley alternatives and the other similarities between the two sites (they are less than a mile apart, and both are on the Reservation), there is no significant difference in the impacts between Skull Valley Sites A and B from an environmental (Sections 4.1 through 4.4, 4.7), socioeconomic (Section 4.5), cultural (Section 4.6), or, consequently, an environmental justice perspective. Site B would require an additional 800 m (2,600 ft) linear distance and 9.7 ha (24 acres) for the proposed rail line. This additional land would not result in any significantly different environmental justice impacts from those described for the rail line in Section 6.2.1. Therefore, the environmental justice impacts from this alternative would be nearly identical to those described above for the proposed action.

6.2.3 Impacts of Alternative 3

The construction and operation of the proposed PFSF at Site A and the ITF would potentially affect the same minority and low-income populations identified in Section 6.2.1. The environmental justice impacts from the construction and operation of the site would be the same as those described in Section 6.2.1. The area for the proposed ITF has not been identified by any groups as an area used for hunting or gathering or holding any cultural significance for any Native Americans or other minority or low-income populations. The operation of the ITF would have adverse radiological and non-radiological impacts to individuals using Skull Valley Road (see Sections 5.5 and 5.7). However, these impacts are considered to be small and would affect all users of Skull Valley Road. Therefore, no disproportionately high and adverse impacts would occur from this alternative.

6.2.4 Impact of Alternative 4

Because of the close proximity of the two Skull Valley alternatives and the other similarities between the two sites (they are less than a mile apart, and both are on the Reservation), there is no significant difference in the impacts between Skull Valley Sites A and B from an environmental (Sections 4.1 through 4.4, 4.7), socioeconomic (Section 4.5), cultural (Section 4.6), or environmental justice perspective. Therefore, the environmental justice impacts from this alternative would be nearly identical to those described above for Site A with the ITF.

6.3 Cumulative Impacts

The cumulative impacts of the proposed action are presented and discussed in this section. The impacts of the proposed action, as described in Section 6.1, are combined with other past, present, and reasonably foreseeable actions, including, where appropriate, the presence of other industrial facilities in the region (see Figure 1.1), to determine whether cumulative impacts exist. Very little development has occurred in Skull Valley, and from the information provided in Tooele County planning documents, PFS reports (PFS/ER 2000) that no new private projects are planned for Skull Valley.

6.3.1 Geology, Minerals, and Soils

Cumulative impacts of construction and operation of the proposed facility in Skull Valley with other proposed construction projects in the area involve the competition for and use of aggregate, crushed rock, and other mineral resources. Because there are no planned projects in Skull Valley and because of the abundance of these materials in the area, the potential for adverse cumulative impacts to geological resources is considered to be small.

6.3.2 Water Resources

Surface water. Cumulative hydrologic impacts of the proposed action would be small. Some minor impacts would likely occur to surface water channels as a result of construction and operation of the proposed PFSF and access routes. Such impacts would be comparable to or less than the effects observed along existing transportation routes such as existing railroads, Skull Valley Road, and other highways. Mitigation measures that would be implemented as part of construction and operational BMPs would result in less impact from the proposed new facilities than are observed in older transportation infrastructure.

Groundwater. Most of the water used for construction of the proposed PFSF and its associated access routes would be purchased from offsite sources and transported to the points of use. There are no known plans for other projects that would require withdrawal of groundwater that, if implemented in addition to the PFSF, would potentially cause an adverse impact on groundwater availability in Skull Valley. No adverse hydrologic impact would result from obtaining water offsite to support construction in Skull Valley. Onsite water use would require less than about 40 L/min (10 gal/min) of groundwater withdrawal from the aquifer in Skull Valley. Groundwater in Skull Valley has been used historically for domestic and agricultural purposes and some wells yield up to 225 L/min (60 gal/min) of flow. These uses are expected to continue at the same rates of withdrawal that have occurred for the past several decades. The planned groundwater withdrawals for the proposed PFSF would not adversely impact other groundwater users in Skull Valley during construction and operation or after decommissioning of the site.

6.3.3 Air Quality

Cumulative air quality impacts have been obtained by including existing emissions sources and background pollutant concentrations into the analyses presented in Sections 4.3.1 and 5.3. These cumulative impacts are considered to be small; hence, no further evaluation of cumulative impacts is necessary.

No other large construction projects are planned for the Reservation or the immediately surrounding area during the most intense period of construction (Phase 1) of the proposed facility, and no other appreciable sources of air pollution in the area appear to be "reasonably foreseeable" during that period. Subsequent phases of construction would produce much less fugitive dust than would Phase 1. The computer-modeled concentrations of air pollutants included the effects of several additional large local sources that may appreciably influence concentrations near the proposed PFSF site, but might have relatively little influence on monitored concentrations at distant sites. These additional sources include Dugway Proving Ground and MagCorp at Rowley, as well as several smaller sources (e.g., Tooele Army Depot).

The largest contribution of the combined off-site sources to the modeled 24-hour PM-10 concentration expected on *any* day at *any* location within 10 km (6 miles) from the construction site is 10 $\mu g/m^3$, at the receptor nearest to Dugway Proving Ground (i.e., the receptor farthest from the construction area in that direction). At that location, the maximum effects of site construction on 24-hour average PM-10 concentrations would be about equal to the maximum effects from Dugway Proving Ground. However, the maximum effects of site construction at that receptor would occur when the wind is from the north, when PM-10 from the Dugway Proving Ground would be transported southward, *away* from that receptor. Therefore, these impacts would not be additive or cumulative. No NAAQS for particulate matter would be exceeded or closely approached, and cumulative impacts would be small.

As described in Section 5.3, rail line construction could occasionally produce moderate cumulative impacts to PM-10 levels on Interstate 80 due to the proximity of the construction site to the interstate. Mitigation measures have been identified in Section 5.3.4 that would reduce the amounts of fugitive dust emitted from the rail line and rail siding construction areas.

6.3.4 Ecological Resources

Vegetation. Constructing and operating the facility as proposed at Site A with the preferred transportation alternative of the new rail line would include clearing existing vegetation within Skull Valley. The OCA for the proposed PFSF would include about 330 ha (820 acres), and an additional 82 ha (202 acres) would be used for the access road right-of-way. Of this total area, only 94 ha (232 acres) would be cleared. About 57 ha (140 acres) of that area would remain cleared for the life of the facility, a 28 ha (68 acres) fire barrier would be planted with crested wheatgrass, and the remaining cleared area [about 10 ha (24 acres)] would be planted with native vegetation following construction.

Construction of the new rail line, the preferred transportation alternative, would require clearing vegetation and grading soil from a total of 314 ha (776 acres) to reach the preferred site (Site A). For this option, approximately 63 ha (155 acres) of desert shrub/grass vegetation would remain cleared for the life of the PFSF, and the remaining cleared area [251 ha (621 acres)] would be replanted with primarily native vegetation following construction.

Thus, the total land cleared for the project as proposed, including the Skunk Ridge rail corridor to Site A, would be 408 ha (1,008 acres), less than 0.4 percent of the land area of Skull Valley. Of the area cleared, only 120 ha (295 acres), about 0.1 percent of the land area of Skull Valley, would remain cleared for the life of the project; the rest would be revegetated with native plants or, in the fire barrier area, planted with crested wheatgrass. The maximum area to be used for the project under this alternative would be about 730 ha (1,800 acres) for the OCA, the access road, and the area cleared for the rail corridor. This amounts to less than 0.7 percent of the area of Skull Valley.

Past activities have had a large impact on native vegetation in Skull Valley. The valley consists of approximately 108,400 ha (271,000 acres) of primarily undeveloped, but relatively disturbed land (see Section 3.4.). Little definitive information is available on its original vegetation. Historical ecological studies, based primarily on anecdotal accounts of early travelers, settlers, and explorers, have shown, however, that marked changes have occurred in the native vegetation of Utah valleys since settlement (Christensen and Hutchinson 1965). Significant vegetation changes occurred from 1859 to 1961 in the Cedar, Rush, and Skull valleys of the Bonneville Basin of Utah (Cottam 1961a and 1961b, cited in Christensen and Hutchinson 1965). Within twenty years of settlement the original desert grasses had been largely replaced by shrubs such as big sagebrush and shadscale. Following those initial changes, junipers began invading those shrub communities. Today, except for vast areas dominated by the recently introduced annual cheatgrass, grass is rarely conspicuous as a dominant in any of these habitats.

Much of the original change in vegetation from grass to shrubs is attributed to overgrazing (Christensen and Hutchinson 1965). Wildfires in conjunction with unrestricted livestock grazing were likely required for the conversion of areas to dominance by weedy annuals like cheatgrass (BLM 1988a, 1988b, 1990; Sparks et al. 1990).

Because the native vegetation in Skull Valley has already been substantially altered by past actions, cumulative impacts on native vegetation from the proposed alternative with a rail line when added to past actions are large. However, the proposed alternative would provide only a small contribution to the existing large impacts on native vegetation resulting from the historical impacts of overgrazing and wildfires. In addition, incorporating measures to revegetate some areas disturbed by the proposed project with native species would reduce the impact of the project and provide a small positive benefit.

Wildlife. The maximum area affected by the project could be 652 ha (1,620 acres). While the construction of the rail line and the fencing of the proposed PFSF could contribute to habitat (or ecosystem) fragmentation, the impacts are expected to be small because (1) the loss of habitat represents less than 0.6 percent of the available habitat in Skull Valley, (2) no wildlife species exclusively use only one portion of Skull Valley, and (3) there are no distinct migration or seasonal use patterns for the wildlife in Skull Valley. With no new developments planned for the foreseeable future in Skull Valley, cumulative impacts to wildlife are expected to be small.

Perennial/ephemeral streams and aquatic resources. Because there are only a few existing facilities in Skull Valley and there are no other major facilities planned, cumulative impacts on aquatic resources would be limited to those identified for this proposed action, which are small.

Wetlands. In general, wetlands in Tooele County are in poor condition because of heavy use by livestock, wildlife, and recreationists (BLM 1983). In order to improve the condition of wetlands in northern Skull Valley, BLM prepared the Horseshoe Springs HMP (BLM 1992a). Implementation of this HMP is protecting wetlands and improving their condition. As the proposed action would have only a small impact on wetlands, it would not add cumulative impacts to wetlands in the valley.

Threatened and endangered species and other species of special concern. Wildfires or inadvertent trampling in Skull Valley are the future activities most likely to impact Pohl's milkvetch, the only plant of special concern in the valley (see Section 4.4.2). Pohl's milkvetch has been threatened by past wildland fires and cheatgrass expansions within the greasewood communities in Skull Valley (BLM 1998c). In particular, future human activity near Hickman Knolls (where Pohl's milkvetch has been found) or on land south of the Reservation (where Pohl's milkvetch is more common) would have the potential for small impacts (Kass 1998a) to this plant species. The potential exists for suitable habitat in Skull Valley for this species to be burned or damaged by wildfires. The loss of more of the greasewood community would reduce the moisture, shade, and shelter needed by the plants. However, if wildfires are suppressed near the proposed facility or along the rail line, there would be a small positive cumulative impact on this species.

Because the size of the proposed project is very small when compared to the size of Skull Valley, the cumulative impacts upon Federally and State-listed wildlife species are expected to be small.

6.3.5 Socioeconomics and Community Resources

There are no known or planned activities in Skull Valley that could produce additional impacts to socioeconomic and community resources near the proposed site. However, both of the local transportation routes (i.e., from Skunk Ridge and Timpie) involve rail transfer points located in areas that may be used in the future for similar expansion (e.g., for other waste management activities in Tooele County's Interstate 80 Planning District). Given that the residential and infrastructure options for employees at the proposed site are similar to those for all other activities in Tooele County (i.e., live in and commute from Rush Valley or Tooele Valley), the potential for cumulative impacts to socioeconomic and community resources does exist.

6.3.6 Cultural Resources

The construction and operation of the proposed PFSF, including transportation aspects, at Skull Valley will create a moderate impact to one resource listed on the NRHP and only minor adverse impacts to other cultural resources, primarily due to the low number of known resources in the proposed project areas (see Sections 4.6 and 5.6). Additional recording and documentation of part of the Hastings Cutoff Trail in the proposed rail corridor would be beneficial in expanding knowledge of this significant historic property. There are no other proposed actions in the area that would induce a cumulative impact on cultural resources in Skull Valley. Therefore, the staff finds that the cumulative impact to cultural resources is of small significance based on the low number of resource properties affected, and the availability of accepted mitigation measures to reduce the severity of any impact on affected resources.

6.3.7 Human Health Impacts

According to Skull Valley Band and Tooele County officials, there are no other known private or public actions under consideration in Skull Valley. Therefore, there is no potential for cumulative effects on worker or public health, beyond what has been described for the proposed action in Section 6.1.7. These impacts have been determined to be small.

Cumulative effects on members of the public due to the presence of radioactive materials in Skull Valley include the effects of the proposed facility, in addition to effects that result from other known sources of radiation and pollution in the region. There are no foreseeable projects that would add substantially to the radiation environment in Skull Valley.

The nearest resident is about 3.2 km (2 miles) distant from the proposed facility and could receive a maximum dose of 0.024 mrem/yr. This is about 0.008 percent of the radiation dose due to natural background radiation in the United States (see Table 3.18). Such small radiation doses can be received just by traveling from sea level to a few hundred feet of elevation, by moving to a different part of the United States, or by choosing one building material over another (such as stone vs. wood) (NCRP 1987b). In other words, a dose of 0.024 mrem/yr is well below the variability associated with the natural radiation environment in which humans live.

As reported in Section 5.7, the risk of latent cancer fatalities for SNF shipments through Salt Lake County to the proposed PFSF would be no higher than 0.0025 per year. The Envirocare Facility west of Skull Valley accepts low-level radioactive wastes for disposal. Some of this radioactive material may pass through Salt Lake County, contributing to radiation exposures and cancer risks to county residents. In addition, some radioactive materials may pass through Utah on the way to disposal at DOE's Nevada Test Site or elsewhere. The staff has adopted health risk estimates from a recent EIS (NRC 1996 or NUREG-1437, Addendum 1) as a bounding estimate of the other sources of radiation exposure that may contribute to cumulative health impacts. Addendum 1 reports a combined cancer risk estimate of 13 LCFs resulting from over 350,000 radioactive waste shipments through Clark County, Nevada, over a 40-year period (about 0.33 LCF/yr). As explained in Addendum 1, the number of shipments is substantially overestimated for Clark County and would be an extreme overestimate for Salt Lake County. However, if one adds the Addendum 1 estimate of 0.33 LCF/yr to the LCF reported in Section 5.7 (i.e., 0.0025), the cumulative LCF/yr remains almost 7,000 times lower than the effective cancer risk from all causes for Salt Lake County (i.e., 2,300). Consequently, the staff concludes that the cumulative health effects of SNF and other radioactive waste transport on the population of Utah is small.

6.3.8 Other Impacts

Noise. Noise does not add linearly; rather, cumulative effects would be dominated by the loudest audible source. Noise impacts during construction and operation of the proposed PFSF and new rail line have already been evaluated in the earlier discussion of impacts in Sections 4.8 and 5.8. Moderate temporary impacts would result from the substantial increase in road traffic along Skull Valley Road, particularly during the first phase of construction. Other noise impacts are likely to be small.

Scenic qualities. Construction and operation of the proposed PFSF at Site A combined with construction and operation of the rail line and siding would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley as viewed from recreational areas, residential areas, Skull Valley Road, and Interstate 80 (see Section 6.1.8.2).

In addition to this alternative, other past, present and reasonably foreseeable actions have and will continue to affect scenic quality in Skull Valley. Other past and present actions include residential, commercial, and ranch development in and around the Reservation, construction and use of Skull Valley Road and the power distribution line along the road, construction and use of Interstate 80, and construction and operation of other industrial facilities (such as the MAGCorp plant near Rowley, Utah) that are visible from Interstate 80.

The staff estimates the magnitude of existing visual impacts from these past and present actions to be moderate because they have altered noticeably the scenic qualities of Skull Valley and the surrounding area. The staff is not aware of any other future actions that would contribute to cumulative impacts to visual resources.

Together, the impacts of the proposed action and the impacts of these other past and present actions would continue to change the scenic quality of Skull Valley from an undeveloped rural area into an area with residential, commercial, transportation, and industrial developments. The staff concludes that these changes would represent a moderate cumulative impact because they would combine to alter noticeably the scenic qualities of Skull Valley and the surrounding area.

Recreation. There are no known or planned activities in Skull Valley that could produce additional adverse impacts to recreational resources and opportunities near the proposed PFSF site. The BLM is currently reviewing lands it administers near the Cedar Mountains WSA for wilderness characteristics (see Section 3.8.3), but any future determination on the inclusion of those areas to the Cedar Mountains WSA would likely have beneficial impacts to recreation. If BLM does expand the Cedar Mountains WSA to include these properties, the cumulative effect would likely improve rather than impair recreational resources and opportunities on the west side of Skull Valley.

6.3.9 Environmental Justice

A potential consideration under environmental justice is the possibility that, while the environmental impact of a facility is not large, the impact on a minority or low-income community is disproportionately adverse because the group: (1) is being currently affected by other facilities or environmental problems that leave them disproportionately vulnerable to adverse environmental effects of the facility in question; (2) has been disproportionately affected by past projects or environmental practices, leaving them more vulnerable now; or (3) has language barriers, geographical immobility, or inherently poorer access to health care or other response mechanisms than the majority population, again leaving them more vulnerable to any environmental or socioeconomic impact. In this case, the expected radiological impact from operation of proposed PFSF is small for even the most exposed individual for either normal operations or credible accidents; thus, the enhanced vulnerability concern does not apply because very little risk is added by the proposed PFSF facility.

Physicians in Tooele are on contract to the Indian Health Service to provide first-tier medical services to the Skull Valley Band, but inquiries to the Indian Health Service produced no data on the Skull Valley Band. Inquiries by NRC and PFS to the Utah Department of Health also did not produce any data that identified any specific health problems in the Skull Valley Band. It was not possible to identify any unusual incidences of diseases in Tooele County, the smallest area for which published health information is available. While the incidence of chronic diseases is slightly higher in Tooele County than in Utah as a whole, it is not clear that the difference is statistically significant, nor is the income and ethnicity of individuals with chronic diseases available. While sufficient data do not exist that show any unique health conditions among the Skull Valley Band, there is also no evidence that the proposed PFSF would compound any health problems of nearby residents or visitors in the Skull Valley vicinity.

Summary. Examination of the various environmental pathways by which low income and minority populations could be disproportionately affected reveals no disproportionate high and adverse impacts from construction or normal operations. There are also no credible accident scenarios by which such impacts could take place. Thus, the effect of the proposed PFSF on environmental justice concerns through direct environmental pathways is small. When considering past, present, and foreseeable future actions, the impacts from the proposed PFSF would add little to the indirect impacts and cumulative impacts and are considered to be small.

6.4 Unavoidable Adverse Environmental Impacts

There are certain limited potentially unavoidable adverse impacts associated with the construction and operation of the proposed PFSF, as well as with the transportation of SNF. Such impacts are discussed in this section.

6.4.1 Geology, Minerals, and Soils

Unavoidable soil erosion from both wind and water will occur during construction activities. Dust control and stormwater control measures, as well as revegetation of disturbed areas, will minimize soil erosion. With these mitigations, the resulting levels of soil erosion by wind and water should be similar to the levels that currently exist in Skull Valley.

Disturbing the existing soil profile and using aggregate (e.g., crushed stone) in construction are unavoidable adverse impacts of the proposed action. However, only a very small amount of soil is permanently lost in project construction, and aggregate materials could be recovered after decommissioning. Economic mineral resource-located beneath the proposed PFSF and the new rail line would be unavailable for exploitation during the life of the project. These impacts, however, would be small.

6.4.2 Water Resources

Unavoidable impacts to surface water may be related to increased stormwater runoff from the areas of the proposed PFSF due to the presence of impervious surfaces (i.e., buildings, asphalt, concrete). Such runoff would be controlled under general permits (see Sections 1.6.2.1 and 1.6.2.3). Also, the possible presence of motor oils and greases from construction or operations equipment could result in a degraded quality of this runoff compared to what exists now.

No unavoidable adverse impacts on groundwater are expected as a result of construction or operation of the proposed disposal facility, because of the relatively small quantities of water to be used from newly drilled on-site wells. Withdrawal of water from these new wells is not expected to impact other users of groundwater in Skull Valley.

6.4.3 Air Quality

Unavoidable impacts to air quality from construction of the proposed facility would be associated with earth-moving activities that create airborne dust. Through the use of adequate control measures, such as treating disturbed areas with water or chemical surfactants for dust suppression, the potential impacts to air quality due to suspended particulate matter would be minimized. The impact on regional air quality is expected to be small.

6.4.4 Ecological Resources

The project as proposed would require the commitment of 57 ha (140 acres) for the main facility and 63 ha (155 acres) for a new rail line for a total of about 120 ha (295 acres) for the life of the facility (i.e., up to 40 years). The loss of wildlife habitat in these areas would be unavoidable. In areas lost for the life of the project, the existing vegetation, with the exception of invasive annuals such as cheatgrass, would not be restored unless revegetation is undertaken as part of non radiological decommissioning and closure of the PFSF as required by the lease. Plant species composition and diversity would be altered because of this disruption of the natural vegetation and subsequent revegetation. Although the removal of habitat would be temporary, the natural diversity of plant species may not recover. If revegetation is to be part of non-radiological decommissioning and closure, a plan, similar to those described in Sections 4.4 and 5.4, would need to be developed. Such a plan would be consistent with the then-latest guidance on the matter.

Currently, this land is sparsely vegetated and supports low numbers of wildlife. Small amounts of animal habitat would be unavoidably lost in the disturbed areas during construction activities. It is likely that less mobile species would be lost during construction.

Areas that are to be fenced, including the 40-ha (99-acre) restricted-access area, would be unavoidably lost for use by certain wildlife species such as mule deer and pronghorn antelope for as long as the fences are up.

6.4.5 Socioeconomic and Community Resources

Because of the size of the regional employment force and the relatively small number of workers to be employed on the proposed project, no adverse socioeconomic impacts are expected from the project. Likewise, there should be no adverse impacts to the local infrastructure, with the possible exception of traffic on Skull Valley Road. Increased traffic would accompany construction and operation of the proposed facility.

Construction and operation of the proposed PFSF should have no adverse impact on the use of off-site land near the site on the Reservation. However, construction of a new rail line from Skunk Ridge would impact the land use of the proposed right-of-way corridor, including grazing areas, until such time as the rail line were removed and the land revegetated.

6.4.6 Cultural Resources

Based on cultural resources field inventories of all proposed project areas in Skull Valley, two historic sites may be affected by construction of the Skunk Ridge rail line. One of these may be avoided by construction activities; however, the Hastings Cutoff Trail would be directly affected as the historic trail transects the rail corridor. Thus, a segment of the trail that currently retains a high degree of physical integrity will be destroyed. In addition to the impact to the physical integrity of the trail, the presence of the rail line will be an intrusion on the place and setting of the historic trail in an area that still evokes an impression of the original cultural landscape of this western migration route.

6.4.7 Human Health Impacts

The impacts of radiation emitted from SNF casks during transport to or storage at the proposed PFSF cannot be avoided. However, the radiation doses that would occur as a result of the proposed action are well below NRC regulatory limits, and represent a small fraction of the existing background levels of radiation.

6.4.8 Other Impacts

6.4.8.1 Noise

Increased noise will accompany construction and operation of the proposed facility; however, the anticipated noise levels will not create adverse impacts. Increased traffic on Skull Valley Road due to workers at the facility, as well as noise from the train(s) moving SNF to the proposed facility from the new Skunk Ridge siding, would generate additional noise. The increase noise would be audible to residents along Skull Valley Road.

6.4.8.2 Scenic Qualities

Because the proposed facility differs from the rural and undeveloped nature of the surrounding landscape, visual impacts to the scenic qualities of Skull Valley would be unavoidable during construction and operation. After the SNF has been removed to a permanent repository, the impacts to the scenic qualities of Skull Valley could be eliminated by removing all facilities and recontouring the landscape to its original condition.

6.4.8.3 Recreation

There should be no unavoidable adverse impacts to recreation associated with the construction and operation of the proposed project at the proposed site. Construction and operation of the proposed rail line from Skunk Ridge to the proposed site may have some limited adverse impacts to certain recreational values found on the BLM-administered land (e.g., solitude and some OHV activities) but would not adversely affect others (e.g., camping and bird watching). In addition, although the proposed rail line right-of-way does not cross any of the land parcels recently reinventoried for wilderness characteristics, construction and operation of the proposed rail line could change recreational opportunities on adjacent and nearby public lands.

6.4.9 Environmental Justice

The principal unavoidable impact could come through the loss of any species and habitat that may be of subsistence or cultural importance to Native Americans. Depending on what species are affected, this could be of some significance to some of the more traditional Skull Valley Band members. However, the species and habitat found on the site and in the rail corridor have not been identified as unique; therefore, the impact would be small.

6.5 Relationship Between Short-Term Uses of the Environment and Long-Term Productivity

Short-term uses of the environment for the proposed project include (1) using a portion of the Reservation for the interim storage of SNF, (2) using a portion of the land in Skull Valley for a new rail line, and (3) obtaining railbed ballast and construction aggregate from local quarries. These short-term uses of the environment would provide an option to help ensure the continued operation of existing U.S. nuclear power plants.

The proposed action would produce favorable short-term effects on the local economy, including that of the Skull Valley Band. Under the proposed action, economic productivity of the land on the Reservation would be enhanced far above its current use.

The land in Skull Valley that would be occupied by the proposed project is presently undeveloped rangeland. A limited amount of grazing currently occurs on this land, and the land to be used by the proposed PFSF and the new rail line does not have any other current agricultural or productive uses. The use of this rangeland for the proposed project would reduce the amount of such land available in Skull Valley, but the reduction would not be a significant amount. The proposed project would replace this rangeland with an industrial development which has its own infrastructure in the form of a new rail line. The addition of such infrastructure to Skull Valley would increase the productivity and usefulness of the land far above its current use for limited cattle grazing and could potentially increase the opportunities for further economic development for the Skull Valley Band and/or other unused portions of Skull Valley.

The proposed PFSF is an interim facility and would not be a permanent addition to Skull Valley. Upon termination of the lease or the NRC license, the PFSF would be decommissioned, and the property could be reused for other purposes. Likewise, the new rail line could either be removed or reused for other purposes. Therefore, there would be no long-term commitment of the proposed project areas in Skull Valley, and there would be no impairment to the long-term productivity of these areas.

Any increases in suspended particulates and exposure to ionizing radiation associated with construction, operation, and closure of the proposed facility would be short-term and would cease upon termination of the license for the facility.

6.6 Irreversible and Irretrievable Commitment of Resources

The land upon which the proposed facility, the new access road, and the new rail line (or new ITF) would be constructed would be lost to other uses until closure of the facility upon the termination of its license (i.e., 20 to 40 years in the future). The commitment of lands involves the loss of plant and animal resources, as well as habitats that currently exist, or that could exist, on those lands. In addition, certain wildlife species may not be able to use areas to be fenced as part of the project.

Approximately 94 ha (232 acres) of vegetation and wildlife habitat on the Reservation would be cleared for the life of the proposed project. An additional amount of land [up to 63 ha (155 acres) more] could be cleared of vegetation for the life of the project to accommodate a new rail siding and new rail transportation corridor from Skunk Ridge to the proposed site of the facility. The affected areas could be revegetated and returned to current use by wildlife upon termination of the license for the facility.

Construction and operation activities would consume materials that may not be recyclable or recoverable. The portion of excavated soil used to create soil cement would be irretrievably lost. Construction, operation, and closure of the site would require a commitment of human and financial resources. Commitments of machinery, vehicles, and fossil fuels would also be required during the project; however, none of the aforementioned resources are in short supply in the vicinity of the proposed project.

Water would be consumed for dust suppression during construction and during the on-site manufacture of the concrete storage pads and casks. Water used during the project (except for water chemically bound in the manufacture of concrete) would eventually recycle to the atmosphere for distribution elsewhere. Water obtained from aquifers would eventually be replaced by natural recharge processes.

No known commercially valuable mineral resources are expected to be affected by the project; although access to any such resources that may exist beneath the site of the proposed facility and the proposed Skunk Ridge transportation corridor would be precluded until the facility is decommissioned at the termination of its license.

6.7 Potential Impacts of the No-Action Alternative

According to PFS's ER (PFS/ER 2000), not building the proposed PFSF could have the following consequences:

- increased probability of shutdown of operating reactors before operating license expiration due to the lack of adequate SNF storage capacity, with the attendant loss of electrical power generation for that area or region,
- delays in reactor decommissioning activities due to the inability to remove SNF from sites in a timely manner, resulting in continued expenditures associated with SNF storage at permanently shutdown reactors,
- the need to construct additional at-reactor ISFSIs to handle the anticipated need for SNF storage.

The no-action alternative is included in this DEIS to provide a baseline for comparison with the proposed action. Under the no-action alternative, no PFSF and no transportation facilities would be constructed in Skull Valley. The impacts described in Chapters 4 and 5 of this DEIS would not occur, and Skull Valley would remain as it is today (see Chapter 3). No lease payments would accrue to the Skull Valley Band, and their economic situation would likewise continue as it is today.

While the no-action alternative would avoid any impacts on Skull Valley due to the construction and operation of the PFSF, it could lead to impacts at other locations. If the proposed PFSF is not built in Skull Valley, SNF would continue to accumulate at nuclear power plants. Based on current DOE plans, removal of SNF from nuclear power plant sites would not begin until 2010, when DOE anticipates that the permanent geological repository will be ready to begin receiving SNF. Most SNF is currently being stored in SNF pools that were built along with the reactor systems. Some power reactor licensees have expanded their pool storage capacity to accommodate the accumulated SNF. A few have built at-reactor ISFSIs to store their SNF in dry casks using a technology similar to what is proposed for Skull Valley (see Figure 1.5). Licensees that cannot expand their SNF storage capacity at their sites may have to terminate operations when their available SNF storage capacity is filled.

As described in Section 2.2.5, the no-action alternative would allow for only two options in regard to the continued storage of SNF: (1) either the capacity of at-reactor SNF storage facilities would have to be expanded or new at-reactor SNF storage facilities would have to be constructed or (2) the operating reactors would have to shut down when their existing storage capacity is reached. The potential environmental impacts of the first of these two options are examined in this section. While the cooperating agencies recognize that many environmental impacts could result from shutting down nuclear power reactors, a full evaluation of these potential environmental impacts (such as generation of additional air pollution from replacement sources of electricity) is beyond the scope of this DEIS. The local and regional impacts resulting from the loss of electric generating capacity for shutdown reactors, including the potential for increased electricity prices, are speculative and are not addressed in detail in this DEIS.

The NRC has examined, in support of other agency actions, the environmental impacts of at-reactor ISFSIs. In support of its Waste Confidence Decision, NRC examined the environmental impacts of the operation of ISFSIs built at operating nuclear power plant sites. The Commission has made a general determination that, if necessary, spent fuel generated in any reactor can be stored without significant environmental impacts for at least 30 years beyond the licensed life for operation of that reactor at on-site or off-site ISFSIs (see 10 CFR 51.23 and 49 Fed. Reg. 34688; Aug. 31, 1984). The NRC has reviewed the Waste Confidence Decision twice [i.e., in 1990 (55 Fed. Reg. 38474; Sept. 18, 1990) and in 1999 (64 Fed. Reg. 68005; Dec. 6, 1999)] since it was first issued, and in both cases, the Commission basically reaffirmed the findings of the original decision.

On July 18, 1990, the NRC published a final rule on "Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites" (55 Fed. Reg. 29190, July 18, 1990), and issued a general license for storage of SNF at reactor sites (10 CFR 72.210). The environmental impacts of SNF storage at reactor sites were also addressed in an environmental assessment which tiered from the "Final Generic Environmental Impact Statement on the Handling and Storage of Spent Light Water Reactor Fuel," NUREG-0575, August 1979, and the "Environmental Assessment for 10 CFR Part 72 'Requirements for the Independent Storage of Spent Fuel and High-Level Radioactive Waste,'" NUREG-1092, August 1984. The accompanying finding of no significant impact states that:

> *[T]he Commission concludes that this proposed rulemaking, entitled "Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites" will not have a significant incremental effect on the quality of the human environment.*

Eight existing at-reactor ISFSIs with specific licenses issued by NRC were previously identified in Chapter 1 (see Figure 1.5). For all eight ISFSIs, an environmental assessment was completed and a finding of no significant impact was reached. For the no-action alternative with respect to the proposed PFSF, the NRC staff assumes that at-reactor ISFSIs would be constructed at reactor sites where additional storage capacity is needed and where physical constraints, such as available land at the reactor site, do not preclude the construction or operation of an ISFSI. The staff also assumes that the design, construction, and operation of future ISFSIs would be similar to that of existing ISFSIs. While a detailed examination of each reactor site where an at-reactor ISFSI could be built has not been completed, the staff does not expect, as a general matter, based on the previous NRC studies discussed above, that the construction and operation of future at-reactor ISFSIs would result in significant environmental impacts. No further site-specific studies or evaluations have been undertaken in this DEIS in regard to the provision of additional at-reactor storage.

The following discussion includes impact assessments for future at-reactor ISFSIs prepared by the staff as part of the current environmental review. Because of the large number of operating reactor sites, as well as their individual site characteristics, the discussion below is limited to broad observations about the nuclear power industry.

6.7.1 Geology, Minerals, and Soils

Because activities associated with the no-action alternative would occur at existing nuclear power reactor sites, there should be no significant impacts to geology, soils, or on-site minerals beyond the impacts already discussed in existing NEPA documentation for those sites.

The construction or expansion of at-reactor storage facilities would involve the use of construction materials, such as sand, aggregate, and gravel. These resources are generally not in short supply in the United States, and any impacts from their use is expected to be small.

6.7.2 Water Resources

Potential impacts to surface water and groundwater from the no-action alternative could arise from the increased use of these resources during construction and operation of new or expanded at-reactor storage facilities. These impacts are expected to be small based on the previous and current use of such resources for power reactor operations (i.e., considering existing reactor cooling and wet pool storage requirements) and existing on-site storage activities.

6.7.3 Air Quality

For construction activities related to the expansion or construction of new SNF storage at existing reactor sites, there could be air quality impacts associated with site preparation and earth-moving activities. These impacts at an individual reactor site would likely be less than the impacts for the proposed project in Skull Valley because the amount of at-reactor land to be disturbed should be smaller than the 40 ha (99 acres) proposed for Skull Valley, and, consequently, less suspended dust would be generated. However, if the distance to the nearest downwind site boundary and/or to the nearest resident for the new at-reactor storage facilities were less than the distances for the proposed site in Skull Valley, then any reduction in impacts as a result of generating a smaller amount of fugitive dust emissions could potentially be offset by higher airborne concentrations that would be associated with the shorter distances.

6.7.4 Ecological Resources

Potential impacts on ecological resources from the expansion or creation of at-reactor SNF storage facilities could arise from activities associated with disturbance of existing plant and animal habitats. Where storage would be expanded only within the owner-controlled area of existing reactor sites, impacts would most likely be small because of the existing industrial characteristics of these areas. If new SNF storage facilities were developed in the vicinity of existing storage structures and minimal surface clearing were required, impacts to native vegetation, wildlife, wetlands, or species of special concern would be expected to be small.

6.7.5 Socioeconomic and Community Resources

For expansion or construction of new SNF storage facilities at existing reactors, there could be some socioeconomic impacts associated with the size of the workforce, land-use, and local traffic near existing nuclear plants. The potential effects would depend on the site and the type of expansion. Because the amount of additional SNF storage needed at any one reactor would be far less than the

40,000 MTU proposed for Skull Valley, the potential reactor-specific impacts should be smaller than those identified for Skull Valley.

Land use impacts could arise at those existing reactor sites where grazing, recreational activities, and other public access activities occur within the boundaries of the owner-controlled area. Where such activities occur, and where these same areas might be used for the expanded or newly constructed storage facilities, some adverse impacts could occur, but are not expected to be significant.

6.7.6 Cultural Resources

Expansion of SNF storage capacity at existing nuclear reactor sites could have some potential for impacts to cultural resources, if construction activities occur on previously undisturbed acreage at those facilities, but are not expected to be significant.

6.7.7 Human Health Impacts

Both public and occupational doses are associated with routine operations (including SNF storage) at a typical operating nuclear facility. Additional on-site storage of SNF would add a small incremental amount to the existing doses. Incremental increases in doses to workers would be monitored and would be administratively controlled so as not to exceed regulatory limits. Because the combined doses would still comply with NRC regulatory limits, there would be no significant impact to members of the public from the storage of additional fuel.

6.7.8 Other Impacts

6.7.8.1 Noise

Noise would accompany any expansion or new construction of at-reactor SNF storage facilities. The magnitude and extent of noise impacts would be highly site-specific. In general, construction and operation of an at-reactor ISFSI would have noise impacts similar to those from the operational activities at the reactor itself. Hence, any incremental noise impacts would be expected to be small.

6.7.8.2 Scenic Qualities

Creation or expansion of at-reactor SNF storage facilities could cause changes in the visual features of the reactor site. If the new storage facilities were built adjacent to the much larger nuclear reactor facilities, the visual effects would be insignificant because they would not be readily apparent to viewers of the reactor site.

6.7.8.3 Recreation

As discussed in Section 4.2.5, there may be reactor sites where recreational activities occur within the OCA. Where such activities occur, and where these same areas might be used for the expanded or newly constructed storage facilities, some adverse impacts to recreation could occur, but are not expected to be significant.

6.7.9 Environmental Justice

The potential impacts under the no-action alternative would result from the options of expanding SNF storage capability at existing nuclear reactor sites or the cessation of power reactor operations once existing storage capacity has been reached.

In the event that new on-site storage facilities are constructed, such construction and operations would occur within the boundaries of the existing power plants. Because these construction activities are expected generally to result in small impacts (see Section 4.3) to the environment, there should be no disproportionately high and adverse impacts to minority and low-income populations and therefore no environmental justice concern. The additional, incremental radiation that would emanate into the environment from these new storage facilities would comply with NRC dose limits, so no significant offsite impacts and no environmental justice concerns would be expected from radiation.

The primary impact from the premature cessation of power reactor operations would be the potential for increased electricity prices due to more costly storage and/or premature closure of nuclear plants. Such impacts do not necessarily fall more heavily on low-income persons, but these individuals may be less able to meet the increases in costs (which may or may not be significant). If necessary, such impacts could be mitigated with "lifetime rates," or other forms of financial assistance.