Chapter 5

ENVIRONMENTAL CONSEQUENCES

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This chapter provides the scientific and analytical base for the comparison of the alternatives. The discussion addresses the potential direct and indirect effects of each of the alternatives. In addition, this chapter contains discussions of unavoidable adverse effects, the relationship of short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources that would be involved in implementing an alternative.

Four alternatives are analyzed in this Environmental Impact Statement (EIS): Alternative 1 (Continue Current Operations), Alternative 2 (Discontinue Operations), Alternative 3 (Expanded Use), and Alternative 4 (Alternate Use of Withdrawn Lands). Twelve environmental resources and/or environmental resource elements are analyzed for each alternative. These are as follows:

- Land Use (includes land-use designations, site-support activities, and airspace)
- Transportation (includes on-site traffic, off-site traffic, transportation of materials and waste, and other transportation)
- Socioeconomics
- Geology and Soils
- Hydrology (surface hydrology and groundwater)
- Biological Resources
- Air Quality (includes radiological air quality)
- Noise
- Visual Resources
- Cultural Resources/American Indian
- Occupational and Public Health and Safety
- Environmental Justice.

Five programs are analyzed for each of the environmental resources and resource elements. These include the Defense Program, the Waste Management Program, the Environmental Restoration Program, the Nondefense Research and Development Program, and the Work for Others Program. In addition, site-support activities are analyzed for each of the environmental resources and resource elements.

Each program identified within an alternative was evaluated separately to identify its potential environmental impact. By evaluating each program separately, the U.S. Department of Energy (DOE) will be able to identify specific mitigation measures that may be necessary to alleviate the severity of impacts.

This EIS identifies the impacts of past, current, and potential programs of the U.S. Department of Energy, Nevada Operations Office (DOE/NV). Proposed programs are included in one or more of the four alternatives and fall into three basic levels: (1) current activities, (2) planned projects, and (3) proposed projects. Current activities are those that are presently part of the normal operations of the Nevada Test Site (NTS), the Tonopah Test Range, portions of the Nellis Air Force Range (NAFR) Complex, and other areas considered in this EIS, such as the Area 5 Radioactive Waste Management Site. Planned projects are those that are within the five-year planning cycle and are likely to be implemented, such as the Solar Enterprise Zone facility. Proposed projects are not currently considered within the five-year planning window, but have undergone sufficient conceptual development to allow a reasonable assessment. The most reliable data are clearly derived from ongoing activities. Planned projects would present slightly less reliable data. Data for proposed projects would be the least defined, but were determined to be essential to a full and open evaluation and disclosure of the potential effects of the alternatives. To provide an adequate analysis, conservative assumptions and parameter values were used to

evaluate potential impacts of the less-defined activities.

Implementation of any of the alternatives could result in a permanent commitment of resources such as groundwater, soil, biota, minerals, surface area, and subsurface geology and would represent an irreversible and irretrievable commitment of such resources. In addition to the National Environmental Policy Act requirement to identify the irreversible and irretrievable commitments of resources, it is also the intent of the DOE to identify these same resources within the meaning of the Comprehensive Environmental Response, Compensation, and Liability Act, Section 107(f)(1). Though the NTS is not listed on the National Priorities List established by the U.S. Environmental Protection Agency (EPA), the requirement exists to address the natural resource damage liability as discussed in Section 107.

The impact analysis for this NTS EIS is based on the best data currently available. This EIS will serve as a baseline document for the preparation of subsequent, tiered National Environmental Policy Act documents that may be required prior to implementation of future specific projects.

5.1 Alternative 1 - Continue Current Operations (No Action)

Alternative 1, Continue Current Operations, is defined as Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. These programs would continue in the same manner and degree as they have within the past three to five years. This alternative includes programs at the NTS, the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area. A more detailed description of the program projects and activities is presented in Appendix A.

Defense Program. Defense Program operations would continue under the conditions of the ongoing moratorium and the negotiations of the Comprehensive Test Ban Treaty. Stockpile stewardship and nuclear emergency response would continue to be the two main categories of activities included in the Defense Program operations under Alternative 1. Stockpile stewardship includes a program of activities to maintain confidence in the safety, reliability, and performance of the nation's nuclear weapons. Stockpile stewardship activities include nuclear test readiness, one or more underground nuclear weapons tests, if directed by the President, and hydrodynamic tests and dynamic experiments. The DOE cannot speculate on how many tests the President might direct the DOE to conduct in the unlikely event that the United States decides to renew underground nuclear testing. However, the DOE believes that this number is likely to be small and that the total environmental impact of any additional testing would be only a fraction of the impacts caused by the approximately 800 underground tests conducted prior to 1992 and documented in Chapter 4. This chapter describes the impacts each additional test would have and demonstrates that a limited testing program would result in only a few isolated areas of impact. Nuclear emergency response would continue to be composed of the Nuclear Emergency Search Team, the Federal Radiological Monitoring and Assessment Center, the Aerial Measuring System, the Accident Response Group, the Radiological Assistance Program, and the DOE/NV Internal Emergency Management Program.

Waste Management Program. The primary mission of the NTS Waste Management Program would be to continue to serve as a transuranic storage and low-level and mixed waste disposal and storage facility in support of the DOE/NV. The NTS would continue to provide disposal capability for approved waste generated on the NTS, as well as for approved off-site waste generators. The NTS will continue to implement the Waste Minimization/ Pollution Prevention Program as described in Appendix C.6. Waste management activities at the NTS would continue to be conducted in four primary areas: Areas 3, 5, 6, and 11.

The Area 3 Radioactive Waste Management Site would continue to serve the NTS and approved off-site generators as a bulk, low-level waste disposal facility. Under Alternative 1, it is anticipated that two additional cells/craters and no additional support facilities would be opened. Two disposal

units in Area 3 would be closed under this alternative.

Although the Area 5 Radioactive Waste Management Site would continue to serve the NTS as a low-level and mixed waste disposal site, existing capacity would not meet the disposal needs of low-level waste expected to be generated under Alternative 1. Greater confinement disposal technology would continue to be pursued for disposal of high-specific activity waste. The pit used for disposal of mixed waste has sufficient capacity to meet the expected amount generated under this alternative. Therefore, the mixed waste disposal capacity would not be expanded. No sanitary landfill construction or disposal activities would occur in Area 5 under Alternative 1. The Transuranic Waste Storage Unit and the Hazardous Waste Storage Unit would continue to be used to store waste.

Waste management operations in Area 6 under Alternative 1 would include continued storage of polychlorinated biphenyl (PCB) waste, operation of the hydrocarbon landfill, and treatment of low-level waste at the Liquid Waste Treatment System Facility.

The Area 11 Explosive Ordnance Disposal Unit is a thermal treatment unit. Explosive ordnance wastes would continue to be detonated at the Explosive Ordnance Disposal Unit under Alternative 1.

Environmental Restoration Program. The goal of the Environmental Restoration Program is to remediate contaminated sites while complying with applicable environmental regulations and statutes and protecting the public and workers' health and safety. The Environmental Restoration Program projects that would continue under Alternative 1 are the Underground Test Area Corrective Action Unit, Soils Media Corrective Action Unit, Industrial Sites Units, decontamination and decommissioning facilities, Defense Nuclear Agency sites, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.

Nondefense Research and Development Program. The DOE has historically supported a variety of research and development activities at the NTS in cooperation with universities, industries, and other federal agencies. Activities that would continue under Alternative 1 include development of a variety of alternative energy resources, a spill test facility, alternative-fueled vehicles and fueling station, development of an Environmental Management and Technology Development Program, and an Environmental Research Park.

Work for Others Program. The Work for Others Program would continue to be hosted by the DOE and includes the shared use of certain NTS and Tonopah Test Range facilities and resources with other federal agencies (such as the U.S. Department of Defense [DoD]) for various military training exercises and research and development projects. Activities included in the Work for Others Program under Alternative 1 are treaty verification, nonproliferation, counter-proliferation research and development, conventional weapons demilitarization, and defense-related research and development.

Activities at the NTS and NTS support facilities throughout Nevada are and would be affected by implementation of current and future international arms control treaties. Treaties currently in effect or under negotiation that are included as part of the treaty verification activities under Alternative 1 are the Threshold Test Ban Treaty, the Peaceful Nuclear Explosion Treaty, the Chemical Weapons Convention, and the Open Skies Treaty.

Nonproliferation is defined as the use of a full range of political, economic, and military tools to prevent the spread of weapons of mass destruction or missiles, diplomatically reverse the spread, or protect the United States interest against an opponent armed with these weapons, should that prove necessary. Under Alternative 1, the NTS and Tonopah Test Range would continue to provide critical support for the United States nonproliferation goals and objectives, particularly in the areas of research and technology development.

Counterproliferation refers to DoD efforts to combat the international proliferation of weapons of mass destruction. As with nonproliferation, these efforts would continue to include the full range of political,

economic, and military tools available. However, because facilities for developing, producing, and storing weapons of mass destruction would likely be located below ground, a considerable amount of counterproliferation research and development would involve the detection, monitoring, and neutralization of buried targets. Under Alternative 1, the NTS would continue current counterproliferation activities and could become the center for a national counterproliferation program.

Conventional weapons demilitarization activities would continue to include demonstration projects for the disposal or destruction of solid rocket motors and other nonnuclear energetic materials at the NTS.

Defense-related research and development activities under Alternative 1 would include tests and training exercises employing weaponry, such as small arms, artillery, guns, aircraft, armored vehicles, demolitions, rockets, bazookas, and air-dropped armaments, as well as a variety of electronic, imagery, and sensory technologies.

5.1.1 NTS

The following sections describe the potential effects the five programs and the site-support activities could have on the resources at the NTS.

5.1.1.1 Land Use. The land-use analysis includes an assessment of the availability of land; potential disturbance of prime, unique, and other important features or habitat; and compatibility with land-use plans and policies. The baseline for each site and its immediate vicinity was established based on the interpretation of aerial photographs, land-use plans and policies, maps, and other sources available through local, state, and federal agencies and through information in the DOE files. Changes to land-use resource areas associated with the alternatives are compared to baseline land use discussed in Chapter 4, and the potential impacts on these areas are assessed. No impacts to surrounding land uses have been identified under this alternative.

The NTS has been committed to weapons testing since the 1950s, and some of its land areas have undergone changes that are considered to be permanent and irreversible. As stated in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977),

> "...the addition of new underground pockets of radioactivity and the formation of subsidence craters in the test areas of the NTS will deny use of those sites for other nontest-related purposes. As a result of the test program, it will be necessary to subject those areas to rigorous control of access and limited use for an indefinite time. Such an evaluation of land-use impacts is largely qualitative and is supported by the quantitative impact analysis presented in other resource sections."

Defense Program. The entire NTS is designated as a Defense Program site. Defense Program projects, research and development, testing, and experimentation under this alternative are assumed to continue at levels equivalent to the past 3 to 5 years. Therefore, no new impacts to land use are expected. Defense Program activities are consistent with current site and land-use designation definitions. Land-use designation restrictions preclude activities that are inconsistent with current land uses.

The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive. For example, the impacts of conducting two tests would be twice the impact of conducting a single test.

Waste Management Program. Under Alternative 1, ongoing Waste Management Program activities at the NTS would continue at current levels and are consistent with current site- and land-use designation definitions. Therefore, no new impacts to land use are expected.

Environmental Restoration Program. Under Alternative 1, the Environmental Restoration Program would continue at current levels. Therefore, no adverse impacts to land use are

anticipated. After existing facilities are decontaminated, they could be used for other purposes. Removal of plutonium-contaminated soils would provide additional areas that could be used for new facility construction.

Nondefense Research and Development Program. Under Alternative 1, the DOE would continue to support ongoing program operations, but no new initiatives would be pursued. Thus, no new impacts to land use are expected.

Work for Others Program. Under Alternative 1, the DOE would continue to host projects and activities of other federal agencies (e.g., the DoD) at activity levels not exceeding those of the past 3 to 5 years. Activities are consistent with the site- and land-use designation definitions for the areas. No new impacts to land use are expected.

5.1.1.1.1 Site-Support Activities— Site-support activities are discussed in the following sections as an NTS resource that is affected by the implementation of the alternatives. The changes to the site-support activities are estimated based on changes in activities from baseline levels. Four subsections of site support are evaluated, including facilities, services, utilities, and on-site communications.

FACILITIES—Under Alternative 1, facilities would be maintained at approximately the current level. Facilities that are currently not in use would remain inactive, but be maintained to the extent possible so that they might be used at a later time.

SERVICES—Support services, such as law enforcement and security, fire protection, and health care, would remain at approximately the current level under this alternative.

UTILITIES—Water, wastewater, and electrical systems would be maintained to ensure they are defect free. Utilities currently not in use would be shut down and stabilized to the extent possible so that they might be restarted and used at a later time.

ON-SITE COMMUNICATION—Communication systems under Alternative 1 would be maintained at approximately the current capacity. Radio, telephone, and video communication systems would receive routine maintenance as deficiencies are identified. The internal and the United States mail systems would continue to operate.

5.1.1.1.2 Airspace—The effects of continued activities and aircraft operations under Alternative 1 would have a minimal effect on the NTS and NAFR Complex airspace. DOE operations (including Desert Rock Airport activities) may increase by approximately 2 percent each year and military operations may increase slightly under the Defense Program and Work for Others Program. As a result, internal NAFR Complex airspace boundaries may be modified to better accommodate range operations and facilitate movement of air traffic through the NAFR Complex. However, no significant modification to the external NTS and NAFR Complex airspace boundaries is anticipated.

The inherent constraints of the existing NTS and NAFR Complex restricted airspace would continue to require that nonparticipating civil and military aircraft be routed around the NTS and NAFR Complex, as necessary, contingent upon joint-use status, operations in progress, and air traffic considerations. The current level of air traffic control and radar/radio/navigational aid services would likely be maintained or improved under normal upgrade programs.

The possible effect on civilian aviation is keyed primarily to constraints that defense-related airspace might place on routes of flight. General aviation would continue to be diverted around the NTS and NAFR Complex. However, the current level of air traffic control and navigational aid services, as well as the same airspace structures, would most likely be maintained under this alternative. Based on the past trend and on improvements in communication, it would not appear that this alternative would cause a major change in civilian air traffic.

Under Alternative 1, the only activities that would affect airspace would be defense related. Therefore, only Defense and Work for Others Programs will be discussed and evaluated. However, with all programs, occasional flights of helicopters and fixed-wing aircraft carrying supplies and personnel are anticipated.

Defense Program. Activities at the NTS would continue at the levels of the past 3 to 5 years. No new programs or initiatives would be pursued. Activities would likely include an increase in air traffic of approximately 2 percent per year for the next 3 to 5 years.

Work for Others Program. With the Work for Others Program, the continuation of the use of the NTS airspace for various training exercises and associated defense activities is anticipated. However, no commercial air passenger, general aviation, or air cargo activities would occur except for occasional DOE-related cargo and personnel operations or for emergency operations.

Airspace requirements under Alternative 1 would be the same as those currently in effect with the Nellis Air Force Base Air Traffic Control Facility, assuming full air traffic control in the NTS and surrounding area. The continuation of operation at the NTS under the Work for Others Program would not result in changed airspace or additional air traffic impacts.

5.1.1.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.1.2.1 On-Site Traffic—The majority of NTS employees commute to the site by bus and work 4 days per week. Currently there are 54 buses serving the Las Vegas area, and 5 buses that serve the town of Pahrump, located approximately 72 km (45 mi) south of the NTS on State Route 160. These buses have dedicated routes to the following locations on the NTS: Mercury (23 routes), Area 25 (12 routes), Control Point in Area 6 (8 routes), Area 6 operations (8 routes), Area 12 operations (1 route), Area 3 Radioactive Waste Management Site (2 routes), and 1 mail route. There is a limited number of shuttle buses for on-site trips. The average number of daily trips attributable to the commuter buses would be 120 trips per day on roads within the NTS. All buses enter the site through the main gate on Mercury Highway, except for two buses from Pahrump. These buses use Gate 510 on Lathrop Wells Road (Thomas, 1995).

Traffic generated within the NTS as a result of the land use, projects, and activities associated with Alternative 1 is estimated to be 3,370 trips per day. Table 5.1-1 shows the baseline average daily trip generation for each of the programs.

Table 5.1-2 summarizes the average daily traffic volume for the key roadways on the NTS under Alternative 1. The portion of the average daily traffic volume that would be attributable to each program is also provided. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to volumes assigned to each segment on Table 5.1-2 shows that no roadway would experience significant traffic congestion under Alternative 1. The segment of roadway with the highest volume would be the section of Mercury Highway from Mercury to Road 5-01, with an average daily volume of 1,215 vehicles per day.

Defense Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Defense Program is estimated to be 635 average daily trips under Alternative 1. No adverse effects on traffic-flow would occur as a result of the Defense Program.

Waste Management Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Waste Management Program is estimated to be 145 average daily trips under Alternative 1. The Radioactive Waste Management Sites in Areas 3 and 5 would continue to receive and dispose of low-level waste from approved waste generators within the DOE complex. The Area 5 Radioactive Waste Management Site would also continue to make mixed waste disposal capability available to NTS generators. Acceptance of waste quantities would continue at levels consistent with past activity (Shott et al., 1995). Inbound shipments from off-site generators are estimated to be approximately 6,800 in the next 10 years for an average of

Table 5.1-1. Average on-site daily trip generation (one-way trips) by program, Alternative 1

Program	Trips per Day
Defense	635
Waste Management	145
Environmental Restoration	390
Nondefense Research and Development	180
Work for Others	140
Site-Support Activities	1,880
Total	**3,370**

3 shipments per day. The number of waste shipments generated on the NTS is expected to be 11,615 in the next 10 years for an average of 6 shipments per day. The majority of the low-level waste would be shipped to the Radioactive Waste Management Site in Area 5. Access to this site would be provided by the Radioactive Waste Management Site access road from Mercury Highway to Road 5-01. No adverse effects on traffic flow would occur as a result of the Waste Management Program.

Environmental Restoration Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Environmental Restoration Program is estimated to be 390 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of the Environmental Restoration Program.

Nondefense Research and Development Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Nondefense Research and Development Program is estimated to be 180 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of the Nondefense Research and Development Program.

Work for Others Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Work for Others Program is estimated to be 140 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of the Work for Others Program.

Site-Support Activities. Traffic generated on the roads within the NTS as a result of activities associated with site-support activities is estimated to be 1,880 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of site-support activities.

5.1.1.2.2 Off-Site Traffic—Alternative 1 effects on roadway traffic were assessed by estimating the number of trips generated by each program-related activity and considered employees, visitors, residents, and service and delivery vehicles associated with construction and operations. These trips were then assigned to key roadway segments.

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. The major traffic generators at the site under Alternative 1 would be the construction and operation employees (totaling 2,947 employees on site in 1996 through 2005) and their activities. Table 5.1-3 shows a summary of average daily vehicle trips generated by each program activity for the years 1996, 2000, and 2005. Distribution among programs is assumed to remain approximately the same as the current trip distribution. The projected peak-hour traffic on key roads and the

Table 5.1-2. Average daily traffic volumes (one-way trips) on key NTS roadway segments, Alternative 1

Roadway	Segment	Average Daily Traffic Volume						
		Defense	Waste Management	Environmental Restoration	Nondefense Research and Development	Work for Others	Site-Support Activities	Total
	North							
Buckboard Mesa Rd.	Pahute Mesa Rd. to Airport Rd.	65	0	30	0	0	0	**95**
Mercury Hwy.	Tippipah Hwy. to Rainier Mesa Rd.	125	30	90	0	0	0	**245**
Pahute Mesa Rd.	Mercury Hwy. to Stockade Wash Rd.	125	0	60	0	0	0	**185**
Pahute Mesa Rd.	Stockade Wash Rd. to Buckboard Mesa Rd.	65	0	30	0	0	0	**95**
Rainier Mesa Rd.	Mercury Hwy. to Tippipah Hwy.	125	0	30	0	0	0	**155**
Tippipah Hwy.	Mercury Hwy. to Pahute Mesa Rd.	255	0	120	0	0	0	**375**
Tippipah Hwy.	Pahute Mesa Rd. to Rainier Mesa Rd.	0	0	30	0	0	0	**30**
	South							
Cane Spring Rd.	Lathrop Wells Rd. to Mercury Hwy.	0	0	30	70	30	0	**130**
Jackass Flats Rd.	Mercury Hwy. to Lathrop Wells Rd.	0	0	90	90	70	0	**250**
Lathrop Wells Rd.	U.S. Hwy. 95 to Jackass Flats Rd.	0	0	30	20	40	0	**90**
Mercury Hwy.	Mercury Hwy. to Road 5-01	510	145	270	70	30	100	**1,125**
Mercury Hwy.	Road 5-01 to Cane Spring Rd.	510	35	240	70	30	100	**985**
Mercury Hwy.	Cane Spring Rd. to Tippipah Hwy.	510	35	240	0	0	100	**885**
Road 5-01	Mercury Hwy. to Area 5 RWMS	0	95	30	0	0	0	**125**
Road 5-07	Mercury Hwy. to Area 5 RWMS	0	15	0	0	0	0	**15**

NOTE: RWMS = Radioactive Waste Management Site.

Table 5.1-3. Average off-site daily vehicle trip generation, Alternative 1

Program	1996	2000	2005
Defense	330	330	330
Waste Management	60	60	60
Environmental Restoration	90	90	90
Nondefense Research and Development	40	40	40
Work for Others	80	80	80
Site-Support Activities	880	880	880
Total	**1,480**	**1,480**	**1,480**

NOTE: All values are rounded to the nearest 10. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends.

Source: AASHTO, 1990.

associated level of service that would result under Alternative 1 for 1996, 2000, and 2005 is shown on Table 5.1-4. These include the average daily vehicle trip generation, by program, listed in Table 5.1-3.

Based on American Association of State Highway Transportation Officials standards, level of service B is appropriate for freeways and arterials and rural highways (level or rolling terrain). Level of service C is appropriate for rural (mountainous), urban, and suburban highways. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990). By 2005, all key roads in the immediate vicinity of the site (U.S. Highway 95, the Mercury interchange ramps, and the access highway to the site, State Route 433) would continue to operate at level of service C or better, which is acceptable according to American Association of State Highway Transportation Officials standards. However, key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) already operate at levels of service ranging from A to F, and by 2000, they would all deteriorate to an unacceptable level of service F. These conditions would prevail even without Alternative 1 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam already operates at an unacceptable level of service F, and its level of service would continue to deteriorate further with or without Alternative 1 activities because of its geometry (steep grades and narrow curves) and partially because of its moderate traffic volume and truck traffic. All other key roadways would generally continue to operate at a level of service C or better throughout the period of analysis.

The off-site conditions described above would occur with or without Alternative 1 and with or without any single program activity. The following sections address the contribution of each program activity to traffic impacts.

Defense Program. The major Defense Program traffic generators in 2005 under Alternative 1 would be the approximately 660 on-site employees, generating approximately 330 vehicle trips on a typical weekday in 2005. Except for site-support, defense-related activities would have the highest number of daily vehicle trips (22 percent of the total) and the most traffic impacts.

Waste Management Program. The major traffic generators in 2005 under Alternative 1 would be the 112 on-site employees associated with the Waste Management Program, generating approximately 60 vehicle trips on a typical weekday in 2005. The Waste Management Program-related activities would contribute 4 percent of the total number of daily vehicle trips.

Table 5.1-4. Peak-hour traffic volumes and level of service on key roads, Alternative 1

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 @ California/Nevada state line	6,800	2,980	E	3,749	F	4,711	F
I-15 north of Sahara Avenue interchange	10,200	7,321	F	9,015	F	11,133	F
I-15 north of the Downtown Expressway interchange	10,200	4,430	E	5,573	F	7,002	F
I-15 just north of the D and Washington interchange	10,200	4,067	D	5,116	F	6,428	F
I-15 north of the Cheyenne interchange	6,800	1,902	C	2,689	D	3,672	F
I-15 south of the Lamb Blvd. interchange	6,800	652	A	852	A	1,103	B
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	636	A	887	A	1,200	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,756	C	2,007	C	2,321	C
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	327	A	412	A	517	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange (North Las Vegas Terminal)	10,200	7,325	F	9,215	F	11,578	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,594	D	3,263	F	4,100	F
Tonopah Hwy. 599 east of the U.S. Hwy. 95/Rancho Road interchange	6,800	1,208	B	1,972	C	2,926	E
U.S. Hwy. 95 south of 157 north of Las Vegas	6,800	843	A	989	A	1,173	B
U.S. Hwy. 95 just east of Mercury interchange	6,800	358	A	385	A	419	A
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	37	B	37	B	37	B
Southbound on-ramp	1,300	242	B	242	B	242	B
Northbound off-ramp	1,300	242	B	242	B	242	B
Northbound on-ramp	1,300	37	B	37	B	37	B
SR[d] 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,200	291	C	291	C	291	C
U.S. Hwy. 95, 6.1 km (3.8 mi) north of Mercury interchange	2,200	283	C	323	C	374	C
U.S. Hwy. 95 @ Amargosa Valley to Beatty	2,000	62	A	69	A	78	A
U.S. Hwy. 95 north of Beatty	2,000	174	B	194	B	218	C
SR 160 south of U.S. Hwy. 95	2,000	74	A	91	A	112	B
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	820	F	987	F	1,196	F
U.S. Hwy. 93 east of westbound off-ramp of Railroad Pass interchange	6,840	2,700	E	3,250	F	3,936	F
U.S. Hwy. 93 north of I-15/U.S. Hwy. 93 interchange	2,000	134	B	168	B	211	B
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	133	B	160	B	194	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	47	A	55	A	65	A
SR 375 west of U.S. Hwy. 93 junction at Crystal Springs	1,500	31	A	34	A	37	A
SR 375 east of Warm Springs	1,500	14	A	15	A	16	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	16	A	17	A	18	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	21	A	23	A	25	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	99	B	90	A	80	A

[a] Vehicles per hour
[b] Directional design hourly volume (one direction)
[c] Level of service
[d] SR=State Route.

Environmental Restoration Program. The major traffic generators in 2005 under Alternative 1 would be the 174 on-site employees associated with the Environmental Restoration Program, generating approximately 90 vehicle trips on a typical weekday in 2005. The Environmental Restoration Program-related activities would contribute approximately 6 percent to the total number of daily vehicle trips.

Nondefense Research and Development Program. The major traffic generators in 2005 under Alternative 1 would be the 86 on-site employees associated with the Nondefense Research and Development Program, generating approximately 40 vehicle trips on a typical weekday in 2005. The Nondefense Research and Development Program activities would contribute slightly less than 3 percent to the total number of daily vehicle trips.

Work for Others Program. The major traffic generators in 2005 under Alternative 1 would be the 157 on-site employees associated with the Work for Others Program, generating approximately 50 vehicle trips on a typical weekday in 2005. These activities would generate approximately 5 percent of the number of daily vehicle trips.

Site-Support Activities. Site-support activities are anticipated to generate 880 vehicle trips on a typical weekday in 2005. These trips account for operations activities related to roads, utilities, communication, and other site support. Under Alternative 1, these activities would contribute to approximately 60 percent of the total number of daily trips in 2005.

5.1.1.2.3 Transportation of Materials and Waste—The expected waste volumes and numbers of shipments for Alternative 1 are identified on Table 5.1-5. Table 5.1-5 reflects a 10-year average estimate of low-level waste volumes and shipments by generator sites for Alternative 1. The yearly average for low-level waste, ignoring NTS generated low-level waste, is approximately 700 shipments/year. Low-level waste, mixed waste, and some defense programs nuclear material would be transported under this alternative. The specific routes analyzed and their lengths are provided in Appendix I.

Defense Program. The Defense Program requires the shipment of special nuclear materials and weapons components in a safe-secure trailer. Information regarding the total number of radioactive materials shipments generated by the Defense Program is classified for reasons of national security. In addition, with the current weapons testing moratorium in place, it is uncertain at this time how many tests and what types of tests would be performed, in the event the moratorium is lifted. Under Alternative 1, a total of 140 shipments of nuclear test devices to the NTS would occur. The risk associated with Defense Programs transportation is low. The risk of radiation induced latent cancer fatality in the exposed population is 4×10^{-5}; the risk of health effects due to vehicle emissions (nonradiological risk) is 1.85×10^{-4}. The risk of a vehicle-related traffic fatality is 6×10^{-4}. The accident-initiated radiological risk of latent cancer fatality is 8×10^{-11}.

The only on-site risk is from the 32 to 40 km (20 to 25 mi) of roadway that the safe-secure trailer would travel. A group of flammable-liquid storage tanks, protected by dikes, is located near Mercury, about 31 m (100 ft) off the roadway. A transportation accident having serious consequences along this route is estimated to have a probability of less than or equal to 1 in 1,000,000.

Waste Management and Environmental Restoration Programs. Under Alternative 1, a waste volume of 350,500 cubic meters (m^3) (458,437 cubic yards [yd^3]) would be expected, of which 350,000 m^3 (457,783 yd^3) is low-level waste. Additionally, 200,000 m^3 (261,590 yd^3) of the waste would be from off-site generators. This volume of waste represents approximately 7,200 shipments for the 10-year period evaluated.

For the transportation risk analysis, health risk was estimated in terms of vehicle-related fatalities and cargo-related deaths and illness, such as latent cancer fatalities, from highway transportation of DOE-generated low-level and mixed waste. The results are given in Table 5.1-6. Traffic injuries and fatalities would be the most dominant risk, followed by the risk of radiation-induced cancer, which would be dominated by incident-free transportation.

The nonradiological accident risk along the entire route for the 10-year duration of the program is an estimated 2 vehicle-related fatalities and 27 injuries. It is estimated that 0.002 latent cancer fatalities would be induced over 10 years as a result of exposure to radiation. Inside the borders of Nevada, the risk of a traffic-related fatality is estimated to be 0.02 in 10 years, and 1 traffic-related injury is expected in 10 years. The risk of a latent cancer fatality inside Nevada during 10 years is 6×10^{-4} ($6 \times 10^{-4} = 0.0006$). The consequence and probability of the maximum foreseeable accidents were calculated based on the total number of low-level radioactive waste shipments to the NTS. The most severe consequence from a low-level waste accident would be 8.08×10^{-3} latent cancer fatalities and 1.04×10^{-3} radiation detriments. The maximum probability of occurrence of this accident is 2.25×10^{-5}. There is no off-site mixed waste received at the NTS under Alternative 1.

On-site risks include those from the transport of NTS-generated waste, as well as those from the on-site transportation of wastes generated off site. As with off-site transportation, the risk is dominated by vehicle-related fatalities and injuries; the cargo-related risks are very small.

Table 5.1-5. Low-level volumes and shipments by generator site[a], Alternative 1

Generator Site	Waste Type	10-year Volume (m^3)[b]	10-year Volume (yd^3)[c]	Number of Shipments[d]
Aberdeen Proving Ground	LLW[e]	790	1,033	21
Energy Technology Engineering Center	LLW	614	803	6
Fernald Environmental Management Project	LLW	84,177	110,099	2,213
Lawrence Livermore National Laboratory	LLW	1,928	2,522	51
Inhalation Toxicology Research Institute	LLW	344	450	9
Mound	LLW	60,027	78,512	1,578
Nevada Test Site (WM)[f]	LLW	500	654	20
(ER)[g]	LLW	115,000	150,414	8,800
Oak Ridge National Laboratory	LLW	26,607	34,801	699
Pantex Plant	LLW	769	1,006	20
RMI Extrusion Plant	LLW	5,528	7,230	146
Rocky Flats Environmental Technology Site	LLW	14,000	18,311	2,000
Tonopah to NTS	LLW	35,191	46,028	2,707
Sandia National Laboratories, CA	LLW	219	286	6
Sandia National Laboratories, NM	LLW	3,600	4,709	9
Total[h]		**349,294**	**456,858**	**18,285**

[a] All volumes are derived from the 1994 Integrated Data Base and the Waste Management Programmatic EIS inventory projections
[b] Cubic meter
[c] Cubic yard
[d] Assumes an average of 12 containers per shipment
[e] LLW = Low-level waste
[f] Waste Management Program operations
[g] Environmental Restoration Program operations
[h] Includes internally generated waste for WM and ER

Source: 1994 Integrated Data Base (DOE, 1995a) and the Waste Management Programmatic EIS (DOE, 1995b).

Table 5.1-6. Transportation risks, Alternative 1

	Transportation Risks	Transportation Risks Inside Nevada	On-site Transportation Risks for Off-site Shipments	On-site Transportation Risks from NTS-generated Waste (One-way trips)
TRAFFIC				
Fatalities	2.04±0.01	0.0229±0.0002	3×10^{-2}	6×10^{-2}
Injuries	26.6±0.2	1.1±0.1	3×10^{-1}	7×10^{-1}
RADIATION CANCER[a]				
Incident Free[b]	0.002±0.0005	$(6\pm2) \times 10^{-4}$	3×10^{-3}	1×10^{-3}
Average Exposed Individual[c]	$(8.2\pm) \times 10^{-8}$	$(7.8\pm2.6) \times 10^{-9}$	8×10^{-8}	1×10^{-10}
Maximally Exposed Individual[d]	$(1.1\pm0.4) \times 10^{-6}$	$(1.6\pm0.7) \times 10^{-7}$	9×10^{-8}	3×10^{-9}
RADIATION DETRIMENT[e]				
Incident Free	$(1.8\pm0.4) \times 10^{-1}$	$(4.6\pm1.4) \times 10^{-4}$	0.002	1×10^{-3}
Average Exposed Individual	$(6\pm2) \times 10^{-8}$	$(6.0\pm2.2) \times 10^{-9}$	6×10^{-8}	8×10^{-11}
Maximally Exposed Individual	$(9\pm3) \times 10^{-7}$	$(1.3\pm0.5) \times 10^{-7}$	7×10^{-8}	2×10^{-9}
EARLY RADIATION FATALITIES[f]				
Average Exposed Individual	$(6.8\pm1.8) \times 10^{-7}$	$(6.5\pm2.1) \times 10^{-8}$	7×10^{-7}	9×10^{-10}
Maximally Exposed Individual	$(9.1\pm3.1) \times 10^{-6}$	$(1.3\pm0.5) \times 10^{-6}$	7×10^{-7}	2×10^{-8}
EARLY RADIATION INJURIES[g]				
Average Exposed Individual	$(1.4\pm0.4) \times 10^{-6}$	$(1.4\pm0.5) \times 10^{-7}$	1×10^{-6}	2×10^{-9}
Maximally Exposed Individual	$(1.9\pm0.7) \times 10^{-5}$	$(2.8\pm1.2) \times 10^{-6}$	1×10^{-6}	4×10^{-8}
CHEMICAL CANCER[h]				
Average Exposed Individual	$(9\pm3) \times 10^{-8}$	$(2.4\pm1.1) \times 10^{-8}$	3×10^{-7}	NA[i]
Maximally Exposed Individual	$(2.2\pm0.7) \times 10^{-6}$	$(6.2\pm2.7) \times 10^{-7}$	8×10^{-6}	NA
HAZARD INDEX[j]				
Average Exposed Individual	$(8\pm3) \times 10^{-4}$	$(2.3\pm1.2) \times 10^{-4}$	3×10^{-3}	NA
Maximally Exposed Individual	$(2.1\pm0.9) \times 10^{-2}$	$(5.8\pm3.1) \times 10^{-3}$	7×10^{-4}	NA

[a] The number of latent fatal cancers is expected because of exposure to ionizing radiation. The cancer can develop, and death can occur many years after exposure

[b] Risk resulting from routine, normal day-to-day operations without accidents or other unexpected or unusual occurrences

[c] For accident risk assessment, inhalation exposure to radioactive or chemical materials is assumed to occur under neutral atmospheric conditions (Pasquill atmospheric stability Class D). This results in most-likely or average exposure

[d] For accident risk assessment, inhalation exposure to radioactive or chemical materials is assumed to occur under stable atmospheric conditions (Pasquill atmospheric stability Class F). This results in worst-case or maximum exposure

[e] The total number of health detriment cases because of exposure to ionizing radiation minus the number of latent fatal cancers. Health detriments include genetic damage and development of nonfatal cancer

[f] The number of fatalities expected to occur a relatively short time (a few days to a few months) after acute radiation exposure. Death occurs because of loss of bone marrow function and, at higher doses, gastrointestinal damage and acute inflammation of the lungs

[g] The number of injuries expected to occur a relatively short time (a few days to a few months) after acute radiation exposure

[h] The number of latent cancers expected because of exposure to a chemical carcinogen. Cancer can develop many years after exposure

[i] Not applicable

[j] The ratio between the daily intake of a noncarcinogenic toxic chemical and acceptable reference level. A hazard index less than one indicates that exposure would not result in adverse noncarcinogenic health effects.

Source: Appendix I

5.1.1.3 Socioeconomics. This section discusses the potential socioeconomic effects associated with Alternative 1. The purpose of this section is to identify and analyze the major socioeconomic issues related to each possible future activity at the sites.

This analysis addresses the timing of effects associated with each alternative for future reuse and covers a period extending 10 fiscal years beyond 1996. Results are usually presented for each alternative for the benchmark years 1996, 2000, and 2005. Table 5.1-7 lists the economic activity projections for Clark and Nye Counties, and Table 5.1-8 lists total housing projections.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING—The baseline for this alternative was established from the total employment projected for each of the sites at the end of Fiscal Year 1995. These proposed Fiscal Year 1995 employment estimates are believed to best reflect the staffing levels needed as a result of recent stockpile requirement reductions.

The region of influence for Clark and Nye counties was identified based on the distribution of residents for current DOE and contractor personnel working at the NTS, the NAFR Complex, and the Tonopah Test Range (DOE, 1994). The region of influence was determined to be the area in which approximately 97 percent of current DOE and contractor employees reside. It was estimated that future distribution of direct workers associated with the proposed alternatives would follow the same trend. For the purpose of this analysis, county data projections are accomplished separately. Because of the difference in size, economies, and contributions to the NTS, a misleading analysis would be produced if Clark and Nye Counties were analyzed as one aggregate area of impact. In other words, the effects might be different for each county.

Under Alternative 1, it was assumed that all sites would continue their current mission with the existing facilities that could comply with environmental, safety, and health requirements and current DOE guidance. It was estimated that a 6,576-person workforce would provide the necessary support to maintain current levels of operations. Figure 5.1-1 compares direct employment among all alternatives in 2005. With the 6,576-person workforce, it is estimated that direct payroll and purchases of goods and services would generate 12,516 secondary jobs (12,235 in Clark County and 281 in Nye County).

Table 5.1-7. Economic activity projections, Clark and Nye counties, 1996, 1997, 1998, 2000, and 2005, Alternative 1

	1996	1997	1998	2000	2005
Clark County					
Population	1,077,576	1,112,348	1,148,241	1,223,541	1,380,920
Total Jobs	507,538	523,916	540,822	576,288	650,413
Unemployment Rate	5.8%	5.8%	5.8%	5.8%	5.8%
Personal income ($1,000)	21,307	22,526	23,746	26,184	32,281
Nye County					
Population	27,407	28,918	30,511	33,966	38,516
Total Jobs	10,990	11,596	12,235	13,621	15,445
Unemployment Rate	5.2%	5.2%	5.2%	5.2%	5.2%
Personal Income ($1,000)	481	516	554	637	781

Table 5.1-8. Total housing projections for the region of influence, 1996, 1997, 1998, 2000, and 2005, Alternative 1

Location and Housing Characteristics*	1996	1997	1998	2000	2005
Clark County					
Housing Stock	456,751	471,504	486,733	518,684	585,414
Housing Demand	420,928	434,511	448,532	477,946	539,422
Available Vacancy Units	35,823	36,993	38,202	40,738	45,992
Available Vacancy Rate	7.8%	7.9%	7.9%	7.9%	7.9%
City of Las Vegas					
Housing Stock	159,125	164,264	169,570	180,701	203,949
Housing Demand	147,884	152,656	157,582	167,916	189,515
Available Vacancy Units	11,240	11,608	11,988	12,785	14,434
Available Vacancy Rate	7.1%	7.1%	7.1%	7.1%	7.1%
City of North Las Vegas					
Housing Stock	28,931	31,986	35,041	38,096	46,087
Housing Demand	27,226	30,102	32,980	43,363	31,495
Available Vacancy Units	1,705	1,884	2,061	2,724	1,989
Available Vacancy Rate	5.9%	5.9%	5.9%	5.9%	5.9%
Nye County					
Housing Stock	12,252	12,927	13,639	15,184	17,221
Housing Demand	10,272	10,838	11,435	12,730	14,435
Available Vacancy Units	1,980	2,089	2,204	2,454	2,786
Available Vacancy Rate	16.2%	16.2%	16.2%	16.2%	16.2%
Town of Tonopah					
Housing Stock	1,801	1,833	1,870	1,935	1,959
Housing Demand	1,485	1,509	1,535	1,586	1,606
Available Vacancy Units	316	324	335	348	353
Available Vacancy Rate	17.6%	17.7%	17.9%	18.0%	18.0%
Town of Pahrump					
Housing Stock	6,936	7,477	8,060	9,367	11,757
Housing Demand	6,130	6,609	7,125	8,283	10,396
Available Vacancy Units	806	868	1,935	1,084	1,360
Available Vacancy Rate	11.6%	11.6%	11.6%	11.6%	11.6%
Amargosa Valley					
Housing Stock	491	512	533	579	659
Housing Demand	403	420	438	475	542
Available Vacancy Units	88	91	95	103	117
Available Vacancy Rate	17.8%	17.8%	17.8%	17.9%	17.8%

* Housing stock is the total number of units; housing demand is the total number of occupied units.

Direct earning levels are estimated at $323 million annually, and secondary earnings are estimated at more than $339 million annually. Of these earnings, $300 million in direct earnings and $330 million in secondary earnings would remain in Clark County, and $23 million direct earnings and $9 million in secondary earnings would remain in Nye County.

For all programs, because there would be no change in economic activity under Alternative 1, the unemployment rate would not be affected and would remain at 5.8 percent. Because of a lack of change in employment, no changes in population are anticipated. The demand for housing would not change under this alternative, because no in- or out-migration would be triggered with this alternative.

Defense Program. Under Alternative 1, the Defense Program would account for 1,472 direct jobs and 2,802 secondary positions, for a total of 4,274 jobs.

Waste Management Program. The Waste Management Program would result in no change in total current employment. This program would remain at approximately 726 jobs, including 250 direct and 476 secondary positions.

Environmental Restoration Program. Under Alternative 1, total employment in this program would not change from current levels. This program would account for approximately 1,129 jobs, including 389 direct and 740 secondary positions.

Nondefense Research and Development Program. Under Alternative 1, the DOE would continue to support ongoing program operations, but no new initiatives would be pursued. Total employment in this program would remain at the same levels. This program would support approximately 555 jobs, including 191 direct and 364 secondary positions.

Work for Others Program. Total employment in this program would remain at current levels. This program would contribute approximately 1,016 jobs, including 350 direct and 666 secondary positions.

Site-Support Activities. Under Alternative 1, total employment in this program would remain at the same levels. This program would contribute approximately 11,392 jobs, including 3,924 direct and 7,468 secondary positions.

PUBLIC FINANCE—The fiscal effects of Alternative 1 are presented in this section. Table 5.1-9 outlines the projected financial summary for Fiscal Years 2000 and 2005 under Alternative 1. The fiscal impact of other alternatives can be determined by subtracting their totals from the Alternative 1 future baseline. The remaining fiscal impact would be the specific impact associated with that alternative.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed in Chapter 4.

Under Alternative 1, revenues for Clark County would increase because of increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures, Alternative 1 would result in revenues less expenditures of a negative $2,502,000 in Fiscal Year 2000. It is expected that Clark County would achieve a positive fiscal position by Fiscal Year 2001. In Fiscal Year 2005, revenues less expenditures are expected to be $37,041,000. The fund balance (or reserves) as a percentage of current expense is expected to be 247 percent in 2000 and 379 percent in 2005.

City of Las Vegas. Under Alternative 1, revenues over expenditures for Las Vegas are expected to become positive in Fiscal Year 1995 because of increases in population, personal income, and total employment in the city. Assuming continued increases in revenues and expenditures, Alternative 1 would result in revenues less

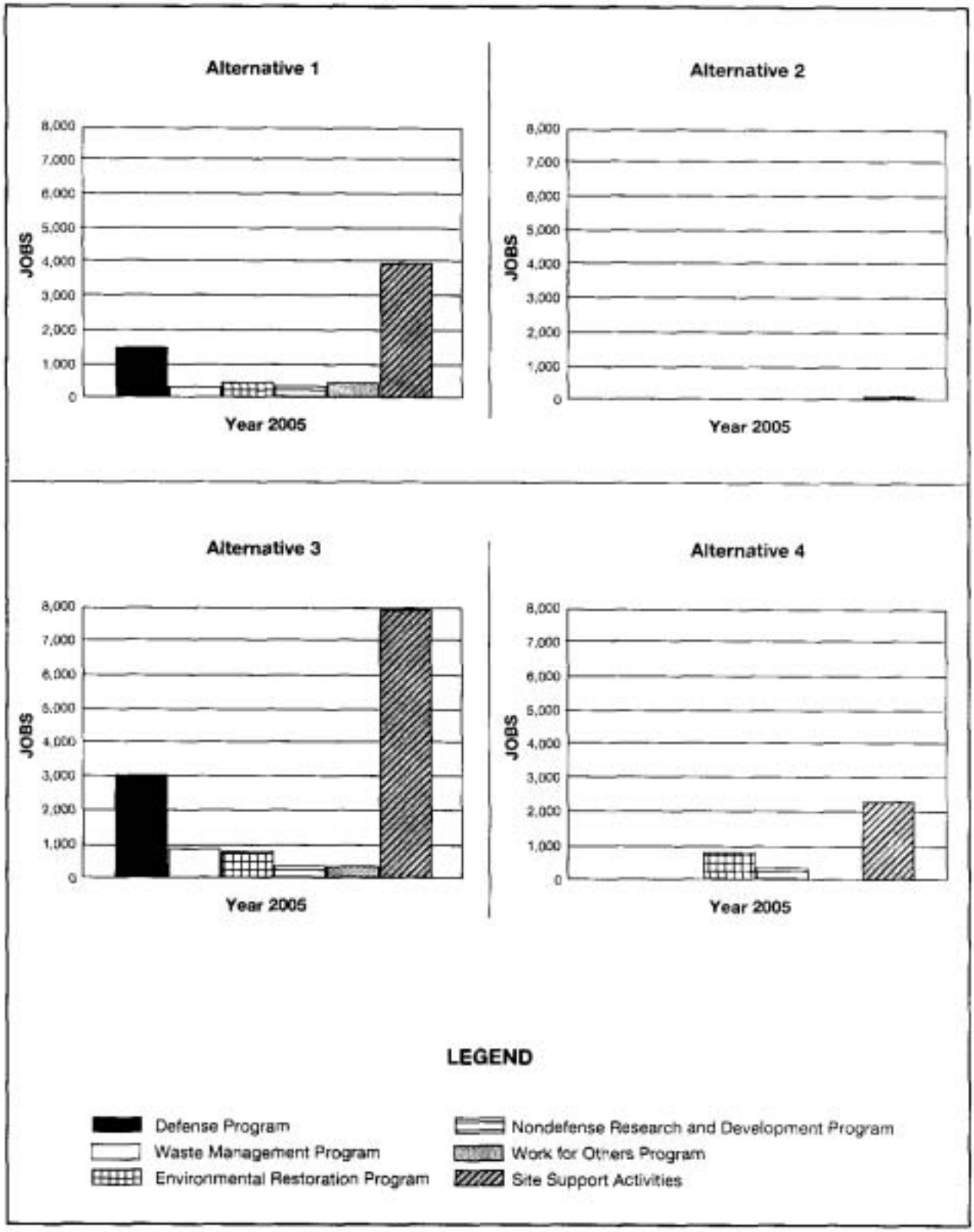


Figure 5.1-1. Total direct employment among all alternatives

Table 5.1-9. Projected financial summary for Fiscal Years 2000 and 2005, general, special revenues, debt service, and capital projects funds, Alternative 1

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($2,502,740)	$525,981,796	$1,301,552,190	247.45%
City of Las Vegas	$14,379,645	$196,970,437	$355,048,190	180.25%
City of North Las Vegas	($7,077,212)	$47,082,837	$29,965,484	63.64%
Clark County School District	($15,067,362)	$751,358,806	$124,171,528	16.53%
Nye County	$1,567,307	$25,905,977	$14,474,565	55.87%
Town of Tonopah	$78,617	$642,646	$823,356	128.12%
Town of Pahrump	$223,877	$944,592	$1,607,833	170.21%
Nye County School District	($1,402,124)	$26,698,631	($438,631)	-1.64%
Fiscal Year 2005				
Clark County	$37,041,321	$563,448,841	$2,136,031,692	379.10%
City of Las Vegas	$16,435,446	$210,832,569	$574,864,206	272.66%
City of North Las Vegas	($6,580,499)	$50,452,640	$47,652,957	94.45%
Clark County School District	($11,167,703)	$848,002,970	$190,429,375	22.46%
Nye County	$3,455,410	$27,922,658	$27,110,664	97.09%
Town of Tonopah	$75,381	$646,767	$1,206,175	186.49%
Town of Pahrump	$315,094	$1,094,844	$3,011,288	275.04%
Nye County School District	($135,592)	$30,272,304	$4,200,315	13.88%

expenditures of $14,380,000 in Fiscal Year 2000. It is predicted that Las Vegas would achieve an increasingly positive fiscal position and by Fiscal Year 2005, revenues over expenditures would be $16,435,000. The fund balance as a percentage of current expense is expected to be 180 percent in 2000 and 273 percent in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue outpacing revenues under Alternative 1. Revenues over expenditures in Fiscal Year 2000 would be a negative $7,077,000 and a less negative $6,580,000 in Fiscal Year 2005, despite increases in population, personal income, and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to slowly grow to 1993 levels by Fiscal Year 2001. The fund balance as a percentage of current expense is expected to be 64 percent in Fiscal Year 2000 and 94 percent in Fiscal Year 2005.

Clark County School District. Under Alternative 1, revenues for the Clark County School District would expand because of increases in population and corresponding school enrollment. Regular program and undistributed expenditures would likely continue to increase at a slower rate. The school district is not predicted to achieve a positive fiscal position by Fiscal Year 2005. In Fiscal Year 2000, revenues less expenditures would be a negative $15,067,000 and in Fiscal Year 2005 a less negative $11,168,000. The fund balance as a percentage of current expense is expected to be 17 percent in Fiscal Year 2000 and 22 percent in Fiscal Year 2005.

Nye County. Under Alternative 1, revenues for Nye County would increase slightly because of small

increases in population, personal income, and total employment in the county. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1996. Alternative 1 would result in revenues less expenditures of $1,567,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,455,000. The fund balance as a percentage of current expense is expected to be 56 percent in Fiscal Year 2000 and 97 percent in Fiscal Year 2005.

Town of Tonopah. Revenues and expenditures for Tonopah would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases, Alternative 1 would result in revenues less expenditures of $79,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $75,000. The fund balance as a percentage of current expense would be 128 percent in Fiscal Year 2000 and 186 percent in Fiscal Year 2005.

Town of Pahrump. Under Alternative 1, revenues for Pahrump would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, Alternative 1 would result in revenues less expenditures of $224,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $315,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 170 percent in Fiscal Year 2000 and 275 percent in the Fiscal Year 2005.

Nye County School District. Under Alternative 1, revenues for Nye County School District would increase slightly because of small increases in population. Local sources would continue to generate the most revenue. Revenues less expenditures would be a negative $1,402,000 in Fiscal Year 2000 and a less negative $136,000 in Fiscal Year 2005. The fund balance as a percentage of current expense would be a negative 2 percent in Fiscal Year 2000 and 14 percent in Fiscal Year 2005.

PUBLIC SERVICES—The public service impacts of all other alternatives can be determined by subtracting total personnel required from the Alternative 1 future baseline. The addition or reduction in personnel required would be the specific impact associated with that alternative. Table 5.1-10 summarizes the levels of service that would be required for Alternative 1. In each case, the current levels of service are assumed to continue.

The Superfund Amendments and Reauthorization Act of 1986 requires state and local jurisdiction, within the United States, to plan for and have the capability to respond to incidents involving all hazardous materials, including waste, that reside in or pass through their jurisdiction. This process is implemented through the Local Emergency Planning Committee and the State Emergency Response Commission. As part of this program, local communities and counties are required to implement an Emergency Response Plan. These plans define chain-of-command, notification procedures, and evacuation procedures for each community.

For the past 15 years, the DOE has provided training to responders in Nevada through the First-On-Scene Program. The environmental safety and health training will continue to be made available to state regulators, educators, the public, and agencies (firefighters, law enforcement, and emergency, medical personnel) within Nevada. Training courses for environmental safety and health, transportation, radioactive materials management, environmental restoration, and classes that meet or exceed federally-mandated training requirements for personnel involved with the generation or disposal of radioactive or hazardous waste can be provided by the DOE/NV. Courses conducted associated with transportation activities include: first-on-scene responder for law enforcement, firefighters, and emergency medical personnel.

Public Education. A total of 7,928 full-time equivalent licensed teachers were employed by the Clark County School District in the 1993 to 1994 school year, resulting in a student-to-teacher ratio of 18 students to 1 teacher. To continue with this ratio, the Clark County School District would

Table 5.1-10. Projected levels of public service for Fiscal Years 1996, 2000, and 2005, Alternative 1

Jurisdiction	Level of Service *	1996	2000	2005
Clark County School District Teachers	18.33	8,665	9,839	11,105
Nye County School District Teachers	16.39	273	338	384
Las Vegas Metropolitan Police Department (Las Vegas and county rural areas)	2.27	1,330	1,510	1,705
North Las Vegas Police Department	1.75	142	161	182
Nye County Sheriff's Office (Tonopah)	3.67	14	15	15
Pahrump Sheriff's Substation	1.85	30	41	51
Beatty Sheriff's Substation	2.59	5	6	5
Amargosa Valley Sheriff's Substation	2.01	2	3	3
Clark County Fire Department (urbanized unincorporated areas)	1.04	440	500	564
Las Vegas Fire Department	0.84	316	359	406
North Las Vegas Fire Department	1.15	93	106	120
Tonopah Volunteer Fire Department	7.09	27	29	30
Pahrump Volunteer Fire Department	1.98	32	44	55
Beatty Volunteer Fire Department and Ambulance Service	14.51	29	31	28
Amargosa Valley Volunteer Fire Department	23.12	26	31	36
Clark County Medical Doctors	1.37	1,481	1,681	1,897
Clark County Registered Nurses	4.84	5,220	5,927	6,689
Nye County Medical Doctors	0.34	9	12	13
Nye County Registered Nurses	1.53	42	52	59

* Level of services is per 1,000 population. The number of school teachers is based on student-to-teacher ratios, and the number of students is based on a percentage of the population.

require 11,105 teachers by the school year 2004 to 2005. This is an increase of 40 percent over this period from 1993 to 1994 to 2004 to 2005. The student-to-teacher ratio for the Nye County School District was 16.39 students to 1 teacher in the school year 1994 to 1995. Projecting this ratio to the school year 2004 to 2005, a total of 384 additional teachers would be required. This additional increase is 61 percent above the 1994 to 1995 school year's full-time teaching staff.

Police Protection. Assuming the same levels of service in the future, requirements for sworn police and deputy protection in the year 2005 can be examined. The Las Vegas Metropolitan Police Department would require 1,705 sworn officers. The North Las Vegas Police Department would require 182 sworn officers. The Nye County Sheriff's Office in Tonopah would require 15 deputy sheriffs. The Pahrump Sheriff's Substation would require 51 deputy sheriffs, the Beatty Sheriff's Substation would require 5 deputy sheriffs, and the Amargosa Valley Sheriff's Substation would require 3 deputy sheriffs.

Fire Protection. The following discussion addresses firefighter personnel expected to be required in the year 2005 under Alternative 1. The Clark County Fire Department, which handles urban fires in the county, would be expected to require 564 firefighters. Some 406 firefighters would be required in the Las Vegas Fire Department in 2005. The North Las Vegas Fire Department would require 120 firefighters. The Tonopah, Pahrump, Beatty, and Amargosa Valley Volunteer Fire Departments would require 30, 55, 28, and 36 firefighters, respectively.

Health Care. The 1995 level of service for medical doctors and registered nurses was used to determine future needs based on population growth. In 2005, a total of 1,897 medical doctors and 6,689 registered nurses would be required in Clark County. In Nye County, 13 medical doctors and 59 registered nurses would be required. However, because of the present difficulty in obtaining medical services in Nye County, it is anticipated that this level of service would increase in the future.

AMERICAN INDIAN SOCIOECONOMICS— This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the Consolidated Group of Tribes and Organizations (CGTO).

Indian people prefer to live in their traditional homelands. One reason for this preference is that Indian people have special ties to their traditional lands and a unique relationship with each other. When Indian people receive employment near their reservations, they can remain on the reservation while commuting to work. This pattern of employment tends to have positive benefits for both the Indian community and tribal enterprises like housing. The reservation Indian community has the participation of the individual and his(her) financial contribution. The individual payment for housing is tied to income level, so the more a person earns with the job, the more they pay to the tribal housing office, thus making tribally sponsored housing more economically viable.

When employment opportunities decline on reservations, however, often times Indian families must move away from their reservations to seek employment. These situations have resulted in approximately one-half to two-thirds of the tribal members in the CGTO region of influence moving away from their reservations.

As Indian people move away from reservations due to employment opportunities, Indian culture is threatened because the number of families living on reservations declines. Tribal members who choose to relocate from their reservations impact reservation economies, school, housing, and emergency services. Both schools and economies are impacted because federal funding available to tribes is based on population statistics.

With local employment opportunities such as those offered by the NTS to neighboring tribes, prices of tribal housing rise because they are based on income. If a positive balance between increased income and increased cost of living in tribal reservations is achieved, then both individual members and the tribe benefit from employment opportunities. However, continued salary raises may tip the balance toward sharp increase in cost of living, making it unable for tribal members to continue living in the reservation.

Tribal housing programs become jeopardized if vacancies occur in tribal housing projects and cannot be reoccupied. If vacancies occur, tribal revenues and federal funding will be adversely impacted and will make it more difficult to expand housing programs in future years.

Additionally, vacant units require more maintenance. If tribal members are unavailable to occupy a tribal housing unit, then tribes make units available to non-Indians, and this too potentially impacts Indian culture. The increased presence of non-Indians on a reservation or in an Indian community reduces the privacy needed for the conduct of certain ceremonies and traditional practices. When non-Indian children are in constant interaction with Indian children, it creates a situation that potentially disrupts cultural learning opportunities that occur in everyday life.

Small rural reservations must have a sufficient number of people to generate an emergency response capability. The need for emergency services will decline as people move away from the reservation. Tribal members employed in these emergency service occupations may move away because of their marketable skills. Tribal revenues for administration, school, housing, and emergency services will be reduced accordingly, due to a decline in population size.

When Indian people move away from their reservations several dilemmas occur. Typically, Indian people experience a feeling of isolation from their tribe, culture, and family. When an Indian person relocates to an off-reservation area, the individual finds that there are fewer people of their tribe and culture around them. As a result, Indian people must decide on the appropriateness of practicing traditional ceremonies in the presence of non-Indian people. Indian people are continually torn between the decision to stay in the city or return to the reservation to participate in traditional ceremonies and interact with other tribal members. This dilemma occurs on a regular basis and potentially impacts the livelihood and cultural well-being of off-reservation employees

and their families. When off-reservation individuals choose to return to their homelands to participate in traditional ceremonies, they risk their jobs or disciplinary actions against their children who attend public schools due to excessive absenteeism.

Should an emergency situation resulting from NTS-related activities, including the transportation of hazardous and radioactive waste occur, it could result in the closure of a major reservation road. Many of the Indian reservations within the region of influence are located in remote areas with limited access by standard and substandard roads. Were a major (only) road into a reservation to be closed, numerous adverse social and economic impacts could occur. For example, Indian students who have to travel an unusually high number of miles to or from school could realize delays. Delays also could occur for regular deliveries of necessary supplies for inventories needed by tribal enterprises and personal use. Purchases by patrons of tribal enterprises and emergency medical services enroute to or from the reservation could be dramatically impeded. Potential investors interested in expanding tribal enterprises and on-going considerations by tribal governments for future tribal developments may significantly diminish because of the perceived risks associated with NTS-related activities including the transportation of hazardous waste.

Defense Program. *Under Alternative 1, the Defense Program would produce a total of 4,274 jobs. It is expected that a percentage of these jobs would be filled by tribal members from reservations within the American Indian Region of Influence. Many of these Indian people will move away from their reservations to take these jobs causing the socioeconomic impacts discussed above. Increased employment can positively impact American Indian employees and their families; however, this off-reservation employment is expected to adversely impact the social structure and cultural activities on the reservation.*

Waste Management Program. *Under Alternative 1, the Environmental Restoration Program would create approximately 1,129 jobs. Although this is approximately one-third the number of jobs created by the Defense Program, it is anticipated that a higher percentage of American Indians would be attracted to the Environmental Restoration jobs because they are more consistent with American Indian land preservation values. American Indians have special skills that may be especially critical to Environmental Restoration activities, and the CGTO has specifically asked that Indian people be involved in these programs. American Indians have asked to be involved when soil mediation actions remove contaminated soil, and afterwards, during habitat restoration.*

Nondefense Research and Development Program. *Under Alternative 1, no new jobs would be created by the Nondefense Research and Development Program. Were existing research programs, especially the National Environmental Research Park Program, to integrate American Indians into the study designs, it is possible that a few more Indian people would be employed. These shifts in employment are expected to be minor, so no American Indian socioeconomic impacts are expected.*

Work for Others Program. *Under Alternative 1, no new jobs would be created by the Work for Others Program. No American Indian socio-economic impacts are expected.*

Site-Support Activities. *Under Alternative 1, no new jobs would be created by the site-support activities. No American Indian socioeconomic impacts are expected.*

5.1.1.4 Geology and Soils. The impacts to geology and soils resulting from the five programs and site-support activities are presented in this section.

Defense Program. Under Alternative 1, two scenarios for stockpile stewardship are considered. In the first scenario, a state of readiness to conduct nuclear tests is maintained, but no tests are conducted. No impacts to geologic and soil media result from readiness activities. In the second scenario, which the DOE believes to be highly unlikely, the President directs that one or more nuclear test be conducted. These stockpile tests would be conducted on Pahute Mesa and/or

Yucca Flat; because the type of test that would be conducted cannot be identified, the impacts associated with both types of potential tests are discussed.

Approximately 12 acres of surface geologic media are disturbed in each underground nuclear test in Yucca Flat. The surface area disturbed is three times this amount for each test on Pahute Mesa. Radioisotope contamination could extend up to five cavity radii from the point of detonation. Radii of cavities at the NTS range up to 49 meters (m) (160 feet [ft]), and rubble chimneys range up to 351 m (1,150 ft) high (Borg et al., 1976).

The formation of an underground cavity, a subsurface pocket of radioactivity, and a subsidence crater, as a result of underground testing under Alternative 1, represents an unavoidable and incremental impact on the geologic media in the vicinity of the planned tests. There are, however, already hundreds of such cavities and craters on the NTS where radioactivity has been released into the geologic media, as discussed in Chapter 4, Affected Environments. The impacts associated with conducting a single underground nuclear test also are described in Chapter 4 (Sections 4.1.4.2, 4.1.4.3, 4.1.5.1, 4.1.5.2, and 4.1.11), Affected Environments. The adverse impacts on geology and soils of one to a small number of nuclear tests are a small increment when viewed against existing baseline conditions. The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive. For example, the impacts of conducting two tests would be twice the impact of conducting a single test.

Fault reactivation and associated seismicity induced by underground testing of nuclear devices are described in Section 4.1.4. Fault reactivation from testing of nuclear devices disturbs subsurface and surface geologic media, which is potentially significant in terms of resultant limitations on land use or resultant changes in surface and subsurface water movement. The yield or size of underground nuclear explosions is controlled by the Threshold Test Ban Treaty to a maximum high-explosive equivalent of 150 kilotons (kt). For the purposes of this evaluation, any future weapons testing is assumed to occur under this limitation. Currently, underground nuclear testing can be conducted in the Pahute Mesa and Yucca Flat areas. Because geologic structure may differ considerably among the testing areas, predicting the effects of tests prior to characterizing the geologic environment in the unused areas is uncertain. Nevertheless, the geographic areas for testing and the yield limits can be used to estimate ground-motion effects from future weapons tests.

Ground-motion hazards can result from the underground nuclear explosion and secondary seismic effects. Because of the rather complete recording of ground motions emanating from NTS activities, the effects of the weapons testing program are predictable, and damage effects have been documented.

Communities within 48 kilometers (km) (30 miles [mi]) of testing areas that could be most affected by ground motion from underground nuclear explosions are Beatty, Amargosa Valley, and Indian Springs. The closest potential testing area for these communities is 31 to 40 km (19 to 25 mi) away. Table 5.1-11 is a tabulation of peak horizontal ground-motions for 150-kt tests at 31 km (19 mi), using regressions developed by Long (1986). Peak ground acceleration, velocity, and displacement were computed at the 50th and 84th percentiles of the log-normal distributions given by Long (1986) for rock and alluvium recording geology at 31 km (19 mi) for a 150-kt test. Expected peak ground accelerations (g) are well below 0.05 g, which is the acceleration where slight damage might occur in typical buildings less than several stories in height.

Several Nye County mines are located in the testing vicinity, but all are at a distance greater than 40 km (25 mi) from the closest potential testing area. Because the distances from these mines to the underground nuclear explosions are approximately the same as, or greater than, the distances for communities, damage to structures in the mines is not expected. In investigations of earthquake effects to mines (Owen, 1981), there are very few reports of damage. Surveys of mines in the vicinity of the NTS by Owen and Scholl support these findings (ERDA, 1977).

Table 5.1-11. Predicted (50th and 84th percentiles) peak ground motions at localities 30 km (19 mi) from underground testing areas

Distance		Yield	Acceleration (g)*		Velocity				Displacement			
km	mi	kt	50%	84%	50%		84%		50%		84%	
					m/sec	ft/sec	m/sec	ft/sec	cm	in.	cm	in.
Rock												
31	19	150	0.012	0.029	0.009	0.03	0.020	0.07	0.23	0.09	0.51	0.20
Alluvium												
31	19	150	0.009	0.016	0.009	0.03	0.018	0.06	0.28	0.11	0.61	0.24

* Local acceleration due to gravity.

NOTE: All peak values reported are the largest of the radial and transverse components.

In addition to direct ground motion effects of underground nuclear explosions, there is also potential hazard from secondary seismic effects. Secondary effects are associated with co-seismic strain release attributed to the release of tectonic strain, aftershocks that can be associated with tectonic strain release, and events associated with the collapse of cavities created by the underground nuclear explosions. Beyond 4.8 to 9.7 km (3 to 6 mi) of even the largest underground nuclear explosion (greater than 1 megaton), there was no evidence of significant secondary seismic effects associated with the test. In no case has the magnitude of an aftershock been larger than the magnitude of the underground nuclear explosion (URS/John A. Blume and Associates, 1986).

Underground subcritical experiments would produce some physical effects on the geologic media. Approximately 2,314 m^3 (81,700 cubic feet [ft^3]) would be disturbed each year in association with the conduct of up to four experiments. Irreversible effects would include the deposition of radiological material within the cavity mined in the subsurface. Approximately 20 acres of surface geologic media are currently disturbed in association with the Lyner Complex, where these experiments would be conducted.

In addition to the direct effect of detonating nuclear and other devices on geologic media and processes, preparation for such tests also disturbs geologic media. Disturbances include any associated infrastructure, excavated tunnels, and an existing inventory of deep boreholes up to 4 m (12 ft) in diameter for detonation of nuclear devices. Geologic media excavated in tunnels, boreholes, and burrow pits are considered to be permanently lost. Excavation of tunnels and testing conducted in those tunnels could potentially impact slope stability.

Withdrawal of the NTS would continue to exclude locatable minerals from exploration or appropriation. The presence of past production indicates a potential for future production using modern techniques. Thus, some potential impact regarding availability of these undefined resources exists. Industrial minerals and materials are widespread throughout Nevada. The unavailability of these minerals and materials from the NTS has had little effect on Nevada's mining, manufacturing, and construction industries and would probably have little effect in the future. Aggregate resources have been used in the past as part of Defense Program actions, and aggregate mining would continue under Alternative 1. The impacts of this mining are not considered significant with respect to the resource availability. The aggregate

resources of the region are immense, and the demand outside metropolitan Clark County is negligible.

The NTS is considered to have a low potential for geothermal, oil, and gas resources. No impact on these resources is anticipated as a result of Defense Program activities under Alternative 1.

The impacts of soils grading and excavation in support of testing under Alternative 1 are not considered significant. Testing locations in Yucca Flat require that 12 acres be disturbed, while locations on Pahute Mesa require almost 3 times that amount. Given that one or more tests would be conducted under Alternative 1 and that an inventory of prepared sites exists, the associated soil disturbance either already exists or would be minor if a new location(s) was prepared. There is the potential for minor soil contamination as a result of drill-back operations. In the event that such a release occurs and results in soil contamination, corrective actions would be initiated, as required under the appropriate environmental regulations and DOE orders. The soil removed would be lost for the long term.

The consequences of altering the natural drainages and erosion rates are not considered significant. Short-term increases in sediment loss might occur; however, because of the overall slight precipitation over the NTS, increased soil erosion would be limited in both time and extent. Activities associated with conventional high-explosive testing, surface dynamic experiments, and hydrodynamic tests are not anticipated to significantly disturb the surface geology. No significant change in surface topography and drainage paths are anticipated, and, thus, the impacts would be negligible. Construction activities associated with these activities are mitigated to minimize impacts.

Waste Management Program. Craters resulting from underground nuclear tests in Area 3 that meet certain criteria have been excavated to dispose of bulk low-level waste. In this process, the area between adjacent crater pairs is removed, and the floors are reshaped so waste containers can be stacked for disposal. The Area 3 Radioactive Waste Management Site covers approximately 128 acres. The craters that are, and would continue to be, used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal is a beneficial use of lands that have been significantly and unavoidably impacted by past actions.

The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit from the ground surface to a depth of 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste unit does not enhance or promote vertical groundwater flow between the waste unit (subsidence crater) and the deep shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water-potential data indicate that there is no groundwater movement from a 40-m to 96-m (131-ft to 315-ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (23 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are located in the unsaturated zone more than 101 m (330 ft) above the water table. This substantial separation between the shot cavities and the water table provides a further basis, albeit preliminary, to conclude that there is no vertical groundwater flow between the low-level waste unit and the water table. The Environmental Restoration Program will evaluate the potential for groundwater contamination from shot cavities located in the unsaturated zone.

The trenches, pits, and boreholes in Area 5 have been excavated to dispose of containerized low-level waste and mixed waste. The Area 5 Radioactive Waste Management Site covers approximately 732 acres surrounded by a fence. The waste disposal craters and excavations are

anticipated to be closed with an engineered cap. The presence of a landfill is essentially a long-term commitment of the area.

Environmental Restoration Program. Environmental Restoration Program activities on the NTS and NAFR Complex are not anticipated to significantly impact geologic media. Safety tests, venting, drill-backs, and atmospheric tests in certain areas of the NTS and NAFR Complex have resulted in radioactive soil contamination, as described in Chapter 4. Various methods of cleanup of these areas have been proposed, including removal of contaminated soil media followed by revegetation. This method of cleanup could temporarily make the surface vulnerable to erosion by water or wind processes. Chemical stabilization followed by revegetation would provide longer-term stability. Reclamation will be based on the specific circumstances of the site and will be addressed in site-specific reclamation plans. Among the variables which will be considered are size of the area, future use, nature of soils, annual precipitation, slope aspect, and site location. The range of options includes natural revegetation, gravel armoring, chemical stabilization, seeding, planting, and irrigating. When highly intensive revegetation techniques are necessary, subsoils could be amended and irrigation could be used. Soils from areas used for staging and support sites could also be salvaged and replaced at the completion of activities. Some areas would be restored to full productivity, while others would be impaired for the long term. Industrial processes have resulted in various areas of chemical or hydrocarbon soil contamination. Remediation of these areas would result in closure in place or removal to an authorized facility. The soils involved would be lost for the long term.

Nondefense Research and Development Program. Projects conducted within the NTS Environmental Research Park are not anticipated to result in significant adverse impacts to geologic media. Tests conducted at the Spill Test Facility on Frenchman Playa in Area 5 do not pose a risk of significant adverse impact to geologic media at or near the facility (DOE/OFE, 1994).

Work for Others Program. Activities under the Work for Others Program, such as defense-related research, development projects, and military training exercises, could have an adverse impact on geologic media of the NTS and NAFR Complex. One potential impact would be soil contamination resulting from weapons firing tests on the NTS and NAFR Complex. Another would be alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits or deposition of sediments. Weapons-firing tests conducted on the NTS, primarily in Area 25, have contaminated relatively small areas of surface and near-surface geologic media. Lead and depleted uranium are the primary contaminants. Continued tests are assumed to have similar impacts as those in the past. Assuming that contaminants are long-lived, these media would be considered permanently lost either through closure in place or removal to a disposal facility. Removal of the contaminated media would make that surface temporarily vulnerable to erosion by water or wind processes.

Site-Support Activities. Infrastructure and grading associated with disposal of bulk waste in Area 3 and containerized waste in Area 5 have further disturbed nearby surface and near-surface unconsolidated deposits, including soils. Continued aggregate use on the NTS as a result of road and facility construction would result under Alternative 1. Aggregate excavated for site-support activities is considered to be permanently lost. Other geologic resources are not anticipated to be significantly impacted by site-support activities. Site-support structures (i.e., roads and buildings) could be removed, and the disturbed geologic media could be restored.

*5.1.1.5 **Hydrology***. The environmental impacts to surface hydrology and groundwater are described in the sections that follow.

*5.1.1.5.1 **Surface Hydrology***—The impacts to surface hydrology for the five programs and site-support activities are presented in this section. One potential impact from all the programs would be effects to mines (Owen, 1981), and there are very few reports of damage. Surveys of mines alteration of natural drainage paths, resulted in potential preferential erosion of natural or fill deposits,

deposition of sediments, ponding of water, or inundation of infrastructure. There is little surface water present on the NTS or NAFR Complex. Surface waters on the NTS consist of small areas of seepage associated with springs, small ponds associated with production wells, tritium-contaminated ponds created by tunnel drainage, and ephemeral waters caused by convective summer thunderstorms and runoff during wet winters. No surface waters are used for water supply. The ephemeral waters exist in normally dry washes for short periods of time and on the surfaces of playas for periods of days to weeks. Water quality of the ephemeral waters is poor because of naturally high sediment loads and dissolved solids. Activities could have minor effects on drainage patterns and discharge rates because of surface disturbance, existing surficial contamination, and altered infiltration rates (see Sections 4.1.3 and 4.1.5). Change to sediment loads and dissolved solids because of project activities would be minor compared to the natural conditions. No significant change in surface water quality or quantity is anticipated, and, thus, the impacts would be negligible.

Defense Program. Ground-surface disturbance and craters associated with underground nuclear tests have rerouted parts of natural drainage paths in areas of underground nuclear testing. Some craters have captured nearby drainage, and headward erosion of drainage channels is occurring. However, this is considered to be negligible. In some areas of the NTS, the natural drainage system has been all but obliterated by the craters. As noted in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977), the development of surface craters is an unavoidable adverse impact of underground nuclear testing.

Alteration of natural drainage in the areas of nuclear-device testing is considered to be irrevocable. Whether water entering these craters and subsequently infiltrating into the ground has other than a negligible effect on the unsaturated zone, or potentially the saturated zone, is unknown. However, water entering the unsaturated zones or the saturated zone would account for a negligible source component when compared to the overall baseline condition. The erosion would continue, and over extended periods of time could result in some alteration of the natural drainage system. However, the principal areas where cratering has occurred are in Frenchman Flat and Yucca Flat, which are both topographically closed basins, and no effects on drainage would occur beyond the limits of these basins.

The potential impacts of detonating additional underground nuclear device(s) on flow rates of springs on the NTS are assumed to be negligible. Springs on the NTS are located outside the testing areas or are generally upgradient.

The impacts associated with conducting a single underground nuclear test are described in Sections 4.1.4.2, 4.1.4.3, 4.1.5.1, 4.1.5.2, and 4.1.11. The adverse impacts on hydrology of a small number of additional nuclear tests are small when viewed against existing baseline conditions.

The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

Activities associated with conventional high-explosive testing, surface dynamic experiments, and hydrodynamic tests are not anticipated to contaminate the water table. No significant change in surface water quality or quantity is anticipated, and, thus, the impacts would be negligible. Construction activities associated with these activities are mitigated to minimize impacts.

Waste Management Program. Potential flood hazards on the NTS and portions of the NAFR Complex are presented in Section 4.1.5 of Chapter 4, Affected Environments. Siting of waste management facilities is a critical issue in terms of protecting the facilities from floods. Also important, however, is the impact on natural processes and media of siting such facilities in areas of potential flood hazard.

The Radioactive Waste Management Sites in Areas 3 and 5 and other waste disposal areas on the

NTS alter natural drainage paths. The craters that are, and would continue to be used, in the Area 3 Radioactive Waste Management Site resulted from underground nuclear tests. The craters have significantly altered the topography and have significantly impacted the surface drainage as discussed in Section 4.1.5. Emplacement of waste in the craters and subsequent engineered closure of the cells would return portions of the surface topography to a natural grade and help to restore drainage patterns. Similarly, engineered berms at the Area 5 Radioactive Waste Management Site constructed to prevent run-on to the site cause negligible impacts to the natural drainage of the area.

Environmental Restoration Program. Water produced from characterization and monitoring wells drilled as part of the Environmental Restoration Program can only be discharged to the surface if it is in compliance with requirements of the Clean Water Act. Because monitoring of the water would be performed and erosion would be reduced through channel protection, drilling activities would have no significant impact to drainage channels or to downstream springs or surface impoundments. Any accidental discharge of produced water that is contaminated with radionuclides or hazardous substances has the potential to contaminate surface and near-surface geologic media. However, present practice is to contain all discharged water in lined sumps until the water quality is determined.

As with Defense Program activities, the Environmental Restoration Program soil-disturbing activities might result in slight increases in sediment yield and some inorganic compounds in surface water. The only planned Environmental Restoration Program action that could result in significant adverse impacts is the cleanup of large areas of plutonium-contaminated soils on the NTS. Appropriate dust and drainage controls would be implemented to ensure that unacceptable levels of plutonium would not become available for transport via surface water flows. Because such controls would be implemented, the impacts of soil restoration actions on surface water quality would not be considered significant.

Other Environmental Restoration Program activities would not have significant impacts to surface waters on the NTS and NAFR Complex; therefore, the impact of environmental restoration actions on the quantity of surface water resources is not expected to be significant.

Nondefense Research and Development Program. The facilities for the Nondefense Research and Development Program have already been constructed, and no new soil-disturbing actions that might impact the surface water regime are included as part of Alternative 1. Tests conducted at the Spill Test Facility on Frenchman Playa in Area 5 do not pose a significant adverse impact to any surface water at or near the facility (DOE/OFE, 1994).

Work for Others Program. Surface-based testing under the Work for Others Program might have negligible impacts on the surface water regime. Slight alterations in runoff and minor contributions of inorganic compounds and increased sediment yield might occur. Any such impacts would likely be very short term and small scale. Because of the very limited surface water flows and the limited extent of disturbances, significant impacts on the surface-water regime are not anticipated.

Other activities of the Work for Others Program could have a significant impact on surface waters of the NTS and NAFR Complex. Whether these activities have a significant impact is dependent on the size and location of the activity, which are yet to be determined.

One potential impact would be contamination of surface waters resulting from weapons-firing tests on the NTS and NAFR Complex. Weapons-firing tests conducted on the NTS, primarily in Area 25, have contaminated relatively small areas of surface and near-surface geologic media. Lead and depleted uranium are the primary contaminants. Continued tests and military training activities are assumed to have similar impacts as in the past.

Site-Support Activities. As with the five programs discussed prior, a potential impact from the siting of support infrastructure in certain areas would be the alteration of natural drainage paths, resulting in

potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure.

Construction activities could result in some temporary impacts on surface water quality. Anticipated impacts include increases in sediment yield and perhaps in the loading of naturally occurring inorganic compounds (salts). Because of the very infrequent surface water flows, these impacts would likely be negligible and are not considered significant.

Road building associated with well drilling and soil remediation might disturb significant areas of soils. However, because of the very limited nature of surface water resources on the NTS and other DOE-administered lands in Nevada, the impact on surface water flows is expected to be minimal.

5.1.1.5.2 Groundwater—Impacts to groundwater from the five programs and site-support activities are presented in this section. In addition, because groundwater is an important resource in Nevada and the primary source of water for the NTS, the impacts to this resource are analyzed.

The consequences of Alternative 1 activities on the water resources of the NTS and adjacent areas include two broad types of effects: reductions in water resource availability and impacts on water quality. The DOE routinely withdraws groundwater at the NTS and other DOE-administered lands in Nevada. These groundwater withdrawals could result in localized impacts, including a lowering of water levels, changes in groundwater flow directions, and a reduction in the quantity of water available to other users. If large-scale groundwater withdrawals occur, the impacts could increase to include reductions in spring off-site discharge rates, water quality impairment, and reduced underflow to downgradient areas.

The potential for increased percolation of water downward through the chimney and into the groundwater system is another potential impact. However, water entering the unsaturated zones or the saturated zone would account for a negligible source component when compared to the overall baseline conditions. The Desert Research Institute (Tyler et al., 1986) has investigated the effects of craters on infiltration and soil moisture movement, and research is continuing in this area. This study was inconclusive; additional studies are planned during 1997.

Two key areas of environmental concern are located beyond the NTS boundaries to the south: Devils Hole National Monument and Ash Meadows. Devils Hole is a small pool in the limestone in the Amargosa Desert that is the habitat for the desert pupfish. This fish feeds and spawns in the shallow water on limestone ledges in the pool. An adequate water level must be maintained in the pool to provide for the continued success of this endangered species. The Ash Meadows area is a point of regional discharge for the carbonate aquifer system. An estimated 2.09 x 10^7 m^3/yr (17,000 acre-feet/year) discharges to the surface, creating an extensive area of spring pools, streams, and wetlands. These wetlands form a valuable habitat for a great diversity of unique species. While the results of past investigations have not found any impacts resulting from DOE operations on these key environmentally sensitive areas, additional evaluation would be performed using sophisticated numerical simulation methods to ensure the continued existence of the pupfish and the important habitat at Ash Meadows.

Another category of effects is the potential impact of a given activity on the quality of the water resources. The grading of soils and other construction actions could slightly alter the quantity and quality of runoff.

Defense Program. Historically, the total annual demand for water at the NTS since the early 1960s has varied considerably, ranging from about 1.0×10^6 m^3/yr (850 acre-feet) in 1963 to a peak of 4.2×10^6 m^3/yr (3,430 acre-feet) in 1989.

Long-term measurements of the water levels have demonstrated that historic water withdrawals have not resulted in significant impacts on water levels. It is considered unlikely that future Defense Program water withdrawals under Alternative 1 would result in significant impacts. Localized water-level declines and changes in flow direction would occur during periods of active pumping.

These effects would be limited and are thus considered to be unavoidable, but not significant, impacts.

As an unavoidable consequence of underground nuclear testing, the quality of the groundwater under some portions of the NTS has been impaired. If an underground nuclear test is conducted under or near the water table, additional impairment of water quality and further losses of groundwater resources could be expected. NTS standard operating procedures are designed to protect groundwaters from contamination by ensuring that no tests are conducted within two cavity radii (or a minimum of 100 m [328 ft]) of the groundwater table.

The effects of underground testing have been well-documented in Borg et al. (1976), and the hazardous materials associated with testing have been detailed by Bryant and Fabryka-Martin (1991). A detailed discussion of the effects of past underground testing on the groundwater is presented in Sections 4.1.5 and 4.1.11.

Yields, locations, and proximity to the water table of tests to be conducted under Alternative 1 have not been defined. Therefore, it is not possible to estimate the total potential releases to the groundwater. If tests are conducted in or near the water table, then significant releases of radionuclides and hazardous materials into the near test environment are to be expected. The estimated total release of fission and source-term radionuclides and activation products is 804,500 curies (Ci)/kt of explosive yield. Thus, the potential releases to the groundwater environment from testing of a single device far exceed releases from other actions to be included under Alternative 1. Tests conducted well above the water table would release significant quantities of radionuclides and hazardous materials into the unsaturated zone. Some downward migration of these contaminants may occur and may have the potential to contaminate the underlying groundwater.

The ancillary operations related to testing under Alternative 1 are primarily surface-based and have little potential for groundwater contamination. Minor quantities of drilling fluids or lost circulation materials might be introduced into the near-water-table environment during test hole drilling and post-shot drill-back operations. Any contamination that results from these activities would be considered inconsequential compared to the releases from the actual test.

The continuation of testing under Alternative 1 would have a significant impact on groundwater quality only if the testing is conducted in, or near, the water table. In this event, contamination of the near-test groundwater resources would occur. However, because of the conditions at the NTS (long travel paths, sorptive geologic media, slight hydraulic gradients, and the depths of the stockpiled holes), it is not considered likely that significant impacts would occur in areas downgradient of the underground testing locations.

Underground conventional high-explosive, hydrodynamic tests, and dynamic experiments would not affect the groundwater because such tests and experiments would be conducted well above the water table.

Waste Management Program. Water use in support of Waste Management Program actions under Alternative 1 would be minimal. The impact of withdrawing limited quantities of groundwater in support of the Waste Management Program would not result in significant impacts to groundwater availability.

The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal and subsequent capping with engineered covers would prevent the downward migration of precipitation into the waste.

The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit from the ground surface to a depth of approximately 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste unit does not enhance

or promote vertical groundwater flow between the waste unit (subsidence crater) and the deep shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water potential data indicate that there is no groundwater movement from a 40-m to 96-m (131-ft to 315-ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (23 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. The Environmental Restoration Program, will evaluate the potential for groundwater contamination from shot cavities located in the unsaturated zone (more than 101 m [330 ft] above the water table).

After 30 years of waste disposal operations, groundwater monitoring at the Area 5 Radioactive Waste Management Site has not detected any contamination. In addition, field studies conducted to support the Performance Assessment (Shott et al., 1995), which included monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations at the Area 5 Radioactive Waste Management Site would occur during the timeframe covered by this EIS and long into the future. (See Volume 1: Appendix A, Section A.2; Chapter 2, Section 2.5.6; and Chapter 4, Section 4.1.5.2 for additional information.)

Environmental Restoration Program. Groundwater use during environmental restoration activities would be minimal and would be limited to that used in pad and road construction, dust control, drilling and testing of characterization wells, decontamination of sampling materials, and purging of wells prior to sampling. Annual water requirements for characterization have not been well defined, but are expected to be minimal. According to information from the Underground Test Area Corrective Action Unit project, the greatest demand for nonpotable water for drilling a characterization well was 7,401 m^3 (6 acre-feet). The total water demand for this program would probably be less than 74,009 m^3/yr (60 acre-feet/year) between 1995 and 2005. Smaller quantities of water would be required to support decontamination and well sampling. Total demand for site characterization activities would probably be 123,348 m^3/yr (100 acre-feet/year), and no significant impact is expected from the withdrawal of such a small quantity of water.

Information concerning future remediation efforts is preliminary. Water demands projected for the decommissioning of some sites (e.g., the demolition of structures at Test Cell C) have been as high as 3,785 liters (L)/day (1,000 gallons [gal]/day) of potable water (or about 1,357 m^3/yr [1.1 acre-feet/year] over a two-year period). Long-term remediation requirements have not yet been determined. If it is assumed that remediation does not include any active groundwater controls, future requirements for monitoring and well-testing would be a few thousands of cubic meters per year (tens of acre-feet per year). If active groundwater controls were implemented (e.g., hydraulic barriers or extraction wells), future water demands could be several million cubic-meters per year (thousand acre-feet per year).

Nondefense Research and Development Program. The current water demand for the Spill Test Facility has not been determined, but is expected to be slight for fire control, safety, experiments, and potable and nonpotable water. Similarly, the Environmental Management and Technology Development Program has unquantified, but minimal, water demands. Some field measurements and testing might be included in the feasibility study of a Solar Enterprise Zone facility; however, any requirements would be negligible. In total, the water demands for the Nondefense Research and Development Program activities would probably be no more than 12,335 m^3/yr (10 acre-feet/year), and no significant impact would be related to this water use.

Work for Others Program. The water demand for the Work for Others Program has not been defined, but is expected to be minimal. The defense-related research and development activities would include the development of nonintrusive detection and imaging capabilities and surface-based testing. Small quantities of water (probably less than 1,234 m^3/yr [1 acre-feet/year]) may be required to support personnel. The withdrawal of this quantity of water is not significant.

Site-Support Activities. The DOE monitored water withdrawals at the NTS for the periods between 1951 through 1990 (see Chapter 4). These records serve as the basis for predicting the demand for water for the period 1996 through 2005. Under Alternative 1, water use is expected to remain relatively stable because the activities included within the alternative are the same as those that have been conducted previously at the NTS. For the purpose of evaluating the environmental consequences of testing, the water-use rate for 1989 was assumed to be representative for active testing conditions. Water use for 1993 was assumed to be representative of the water demand to support nuclear testing readiness.

Because the water required to support the NTS is derived exclusively from groundwater, there would be some level of impacts on groundwater resources. Because the effects of groundwater withdrawals vary depending on the location, geologic conditions, and withdrawal rates, a more detailed evaluation is required.

The localized water-level declines in areas adjacent to operating water supply wells is not considered a significant impact. The impacts of water-level declines would not be considered significant unless water levels decline in areas off site from the NTS or if the quantity of groundwater discharging from the NTS to downgradient areas would be diminished. The U.S. Geological Survey maintains a water-level monitoring network downgradient of the NTS. The water level in the Devils Hole well rose more than 1 m (3 ft) between the lowest recorded measurement in 1972 and the highest recorded measurement in 1993. Similarly, in the Point of Rocks south well, static water levels rose more than 22 m (72 ft) between the lowest recorded measurement in 1970 and 1994. These data and records for other monitoring wells in the region do not show any effects that might be attributed to water withdrawals on the NTS.

5.1.1.6 Biological Resources. Little or no previously undisturbed habitat would be cleared for the Defense, Waste Management, Nondefense Research and Development, and Work for Others Programs. About 9,800 acres of land would be cleared for the Environmental Restoration Program. Most of this land has been contaminated by radioactive or hazardous materials, and some of it has been disturbed previously. Much of that land would be stabilized and/or revegetated. Infrastructure development would result in the removal of approximately 18 acres of previously undisturbed habitat. Collectively, approximately 9,900 acres, part of which has been disturbed previously, would be disturbed by the DOE or DOE-sponsored organizations under Alternative 1. This represents approximately 1 percent of undisturbed habitat present at the NTS (Hunter and Medica, 1992). Military training exercises under the Work for Others Program might impact additional sizeable habitat blocks, but these exercises are not defined well enough to allow estimation of the potential extent of disturbances. No projects in Alternative 1 are large enough that they would likely lower the viability of populations of any species, including candidate species and economically or recreationally important species.

Because Alternative 1 does not include additional atmospheric, safety, or cratering tests, the concentrations of radionuclides that the flora and fauna are exposed to will not increase. Since few deleterious effects were observed in species or populations when such activities were conducted in the past, no additional impacts are anticipated.

The desert tortoise is the only threatened or endangered species commonly found on the NTS. Individual desert tortoises might be accidentally killed or injured during military training exercises. However, because surveys are conducted and tortoises are removed prior to soil-disturbing activities on the NTS, this is unlikely. From 1989 through 1994 on average, less than one tortoise was killed per year on roads on the NTS (DOE/NV,

1991, 1993, and 1994a). Because vehicular traffic patterns are expected to be similar or lower under Alternative 1 than they were during 1989 through 1994, a similar or lower number of tortoises probably would be killed under this alternative. Groundwater withdrawals under Alternative 1 would not likely affect water flow rates at springs on and around the area. Only military training exercises located at or near springs on the NTS or NAFR Complex could significantly impact the biota associated with these springs.

In a Draft Biological Opinion issued to the DOE/NV on May 21, 1996, the U.S. Fish and Wildlife Service determined that the level of effect described in the NTS EIS would not reduce appreciably the likelihood of survival and recovery of the Mojave Desert population of the desert tortoise in the wild or diminish the value of critical habitat both for survival and recovery of the desert tortoise because:

- The proposed programmatic area does not occur within any areas recommended for recovery of the desert tortoise or areas designated as critical habitat.

- Rehabilitation and revegetation of disturbed sites or payment of off-site mitigation fees will benefit conservation and recovery of the desert tortoise as directed under Section 7(a)(1) of the Act.

- The desert tortoise is a wide-ranging species occurring over a large area. The degree of threats to the species vary in different parts of the Mojave Desert, requiring implementation of management actions tailored to the needs of specific areas (Service, 1994). The loss of habitat associated with the proposed action translates to approximately 1 percent of the total habitat on the NTS. With proper management and conservation, important desert tortoise populations both inside and outside designated recovery areas, will remain viable.

- The NTS occurs within the northeastern Recovery Unit in Nye County, Nevada. Activities on the NTS should not result in a substantial loss of the tortoises within this Recovery Unit. The potential effects on desert tortoises as a result of implementation of the proposed programs by the DOE/NV, as described in the *Description of the Proposed Action*, represents a small impact to the Mojave population of the desert tortoise when total desert tortoise population numbers and geographical extent are considered.

Because there would be few significant impacts to population viability, rare species, or rare habitats in the region, Alternative 1 should have little negative impact on biodiversity or ecosystem functions in this area.

Defense Program. No new facilities would be needed for stockpile stewardship or emergency response activities, and transportation of hazardous or radioactive materials would not likely result in significant impacts on biological resources (Appendix I). Therefore, these projects would have no significant impact on biological resources.

Counterproliferation research and development activities involve detecting underground objects related to nuclear testing or eliminating such objects. Some activities would take place in buildings or, if outside, would involve nondestructive sampling. Thus, this part of the project is unlikely to impact biological resources. Other activities might include aboveground detonations near bunkers. Some activities involve developing technologies for the safe rendering of nuclear devices. This includes aboveground detonations of conventional high explosives at the Big Explosives Experimental Facility (see Appendix F). The detonations would take place on the 20 m x 20 m (66 ft x 66 ft) gravel firing pad constructed for high-explosive detonations. The facility site consists of 8 acres of graded and cleared land surrounding the bunkers and firing pad. It is unlikely that explosions would significantly impact surrounding habitat, affect the viability of plant or animal populations, or impact springs. This facility is north of the range of the desert tortoise (Rautenstrauch et al., 1994). Transportation to study sites would be infrequent; therefore, the impact of this program on biological resources would not be significantly increased.

Under Alternative 1, one or more nuclear tests could be conducted underground on Pahute Mesa or in Yucca Flat. Because the DOE has already prepared sufficient sites to handle numerous underground tests, no new impacts on biological resources would arise from maintaining readiness for these tests. A subsidence crater could be created by the underground test of the nuclear device. Because this crater would form in the area disturbed during site preparation for the test, no new loss of habitat would occur. Drilling sumps constructed as part of post-shot drilling operations could attract waterfowl and doves. Exposure to drilling fluid additives might increase these organisms' probability of drowning (Greger, 1995).

Additional releases of tritium into the aquifer from the underground nuclear test would not likely increase the impact to threatened and endangered species located at Devils Hole National Monument or Ash Meadows National Wildlife Refuge. The short half-life of tritium and the slow rate of water exchange between the nuclear test sites and groundwater and the resulting model studies indicate that tritium would not be detected off government-controlled lands (Borg et al., 1976; GeoTrans Inc., 1995). Hydrodynamic tests and dynamic experiments conducted at the existing Big Explosives Experimental Facility in Area 4 and at the Lyner Complex in Area 1 are not expected to impact biological resources. Conventional high-explosives testing is expected to occur in areas previously cleared of vegetation, so no new wildlife or plant habitat would be lost. No other significant impact to biological resources is expected.

The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

Waste Management Program. Activities at the Area 3 Radioactive Waste Management Site would disturb very little of the previously undisturbed areas and would not have a significant impact on habitat or population viability. Closure of the two disposal cells would result in a beneficial impact because these sites would be revegetated with native plants. Area 3 is north of the range of the desert tortoise; therefore, construction and operation would have no effect on this species. This program also would have no effect on other threatened and endangered species or springs and their associated biota.

Land disturbance at the Area 5 Radioactive Waste Management Site is too localized to impact viability of plant and animal populations. Construction activity would include one new trench and closure of several pits and trenches. Because these disturbed sites would be revegetated, this activity would have a positive impact on habitat. Effects on threatened or endangered species would be unlikely given that no tortoises or tortoise sign has been seen in this area (EG&G/EM, 1994), and other threatened and endangered species would be unlikely to use this area. No springs are near this site.

At the Area 6 Waste Management Site, PCBs are temporarily stored prior to being transported off site for disposal at EPA-permitted facilities. Because this waste would be stored in a developed area with no anticipated releases to the environment, this activity would have no biological impacts. Disposal activities at the hydrocarbon landfill in Area 6 are also not expected to impact biological resources.

In Area 11, explosive ordnance would be destroyed in an 8 m x 31 m (26 ft x 102 ft) detonation pit surrounded by an earthen pad. No new land would be disturbed. Detonations occur infrequently. They would not likely impact habitat use by animals in areas around this site, because desert tortoises are rare near this facility. A 40-acre area surrounding this facility was searched in 1991; no tortoise or tortoise sign was found. It is, therefore, unlikely that tortoises would be directly injured or killed by this project.

Environmental Restoration Program. Five projects in the Environmental Restoration Program would occur on the NTS or NAFR Complex under Alternative 1. None of the environmental restoration actions would have significant impacts on population viability or habitat of plants or animals. The impacted areas are small relative to the geographic areas inhabited by affected

populations, and very little undisturbed habitat would be disturbed. About 50 acres would be cleared for the Underground Test Area Corrective Action Unit project; however, much of this land is already disturbed. Burrowing owls, candidate species of bats, and economically or recreationally important species like doves or waterfowl might be exposed to drilling mud contained in drill sumps. Drilling mud, although nontoxic, might contain polymers and surfactants that could coat birds or mammals that land in or drink from the sumps. This could increase their probability of drowning (Greger, 1995). Drilling also might result in production of some hazardous and radioactive wastes; these wastes would be transferred to waste management facilities for disposal. Transport of the removed material to approved disposal sites would not likely impact biological resources (Appendix I).

The second project, the Soils Media Corrective Action Unit activities, would involve the removal and transport of radioactively contaminated soils from 3,257 acres to approved disposal locations. The habitat would be destroyed during soil removal, but may be revegetated afterward. This area is adjacent to the playa and, thus, is not desert tortoise habitat (EG&G/EM, 1991). No candidate species of plants occur on those sites (Blomquist et al., 1995). These activities would not occur near springs nor require pumping of shallow groundwater; thus, the tortoises would not be affected.

The third project, the Industrial Site Unit activities, would disturb about 2,510 acres. Almost all of this land has been disturbed previously and is not wildlife habitat. It is unlikely that desert tortoises would be killed or injured during earthmoving. Surveys would be conducted, and all tortoises would be removed prior to those activities. Removal of hazardous or radioactive materials might have positive impacts on the survival of individuals of threatened or endangered species, such as desert tortoises. Transport of the removed material to approved disposal sites would not likely impact biological resources because workers follow stringent safety protocols (Appendix I). This project is unlikely to take place near springs; thus, springs should not be affected.

During the fourth project, Decontamination and Decommissioning, eight contaminated buildings or building complexes could be torn down and transferred to appropriate disposal areas. Transport of the contaminated material to approved disposal sites would not likely impact biological resources.

There are 100 Defense Nuclear Agency sites in Area 12 of the NTS that were contaminated with radioactive or hazardous waste. This project might continue operations to contain contaminant migration, characterize and remediate contaminated muck piles and ponds, and select and implement post-contamination remediation actions. About 50,971 m^3 (1.8×10^6 ft^3) of radioactive wastes would be removed from a 500-acre area. Therefore, a substantial amount of habitat would be destroyed, but might be revegetated. Revegetation could have a positive impact on habitat in highly disturbed areas because it would advance the successional process in these areas (Call and Roundy, 1991). Cleanup might also have negative impacts on habitat in areas where mature, undisturbed natural vegetation existed prior to cleanup. Transport of the removed material to approved disposal sites would not likely impact biological resources (Appendix I). This project would not take place near springs; thus, springs would not be impacted.

Nondefense Research and Development Program. All five activities within this program would be operational under Alternative 1. The first activity, the Alternative Energy Project, and the second activity, the Environmental Management and Technology Development Project, would be in planning or design stages and would not affect biological resources.

The third activity, the Alternative Fuels Demonstration Projects would not require destruction of habitat or have other negative impacts on biological resources. Over the long term, information from this project might have significant positive ramifications for biological resources because of potential influences on fossil fuel use.

The fourth activity, the National Environmental Research Park, would have no negative effect on habitat, population viability of plants or animals,

threatened or endangered species, or springs. Over the long term, research into many of these topics might have positive impacts on biological resources because the findings could result in improved management of resources.

The fifth activity, the Spill Test Facility, is not expected to result in any significant impact to vegetation or wildlife. A monitoring program was established in 1981 to evaluate impacts from chemical spill tests at various distances downwind (northeast) from the Spill Test Facility. Results of monitoring vegetation, small mammals, kit foxes, lizards, and lagomorphs showed no measurable impacts on these biological resources except for leaf burns observed on vegetation growing in patches of disturbed soil on the playa (DOE/OFE, 1994). No adverse impacts are anticipated to occur at distances greater than 5 km (3 mi) downwind of the facility, near the western boundary of the Desert National Wildlife Range. Desert tortoises are very uncommon near this facility (EG&G/EM, 1991) and probably would not be affected. Chemicals would be dispersed by the time they reach areas where tortoises are known to occur. Information from this project could have positive impacts on biological resources to the degree that it contributes to a better understanding of how to contain and clean up hazardous spills.

Work for Others Program. The Work for Others Program consists of five projects. Treaty verification and nonproliferation projects would have no significant impacts on biological resources. The Conventional Weapons Demilitarization Project would have no expected impacts on biological resources. Defense-related research and development projects have the potential to negatively impact biological resources because of habitat disturbance, either through troop or vehicle movements, ordnance detonation, or fires (Schaeffer et al., 1990). If off-road military exercises occur within tortoise habitat, tortoises might be inadvertently killed. Defense-related research activities performed in the past were essentially benign, consisting primarily of nondestructive sampling and testing, such as infrared imaging. Based on these prior projects, no significant negative impacts are anticipated on biological resources from this activity.

Similarly, defense-related research activities involving hydrodynamic tests are likely to have little or no impact on surrounding habitat, the viability of plant or animal populations, or springs or other water sources. This is because the detonations would take place on the 20 m x 20 m (66 ft x 66 ft) gravel firing pad (constructed for high-explosive detonations) surrounded by 8 acres of graded and cleared land.

Site-Support Activities. The NTS and NAFR Complex are served by existing airfields and by paved and graded roads. Most people and material are transported to these sites via roads. Road maintenance would not significantly impact biological resources because it involves redisturbance of previously disturbed habitat. The southernmost 52 km (32 mi) of Mercury Highway would be repaved, disturbing approximately 6 acres of land for staging areas. In addition, 5 km (3 mi) of the Road 5-01 reconstruction would be completed. This road would run from Mercury Highway to just south of the Area 5 Radioactive Waste Management Site, and would remove approximately 18 acres of undisturbed habitat. The fiber-optic network would continue to be expanded when extensions are added from the two central hubs. Because surveys are conducted and tortoises are found and relocated out of harm's way prior to ground disturbances, it is unlikely that tortoises would be killed during this project. Construction would be unlikely to significantly impact other biological resources. Waterline, powerline, and natural gas line developments are not likely to be extensive.

5.1.1.7 Air Quality. The impacts to air quality resulting from the five programs and site-support activities are summarized in this section. The region of influence for this air quality analysis includes Nye and Clark Counties, Nevada. The emissions from stationary, mobile, and fugitive PM_{10} sources, which are shown in Tables 5.1-12 and 5.1-13, occur within and outside of the NTS. These emissions would be dispersed over the 3,496 square kilometer (km^2) (1,350 square mile [mi^2]) area of the NTS. At the boundaries of the NTS, ambient pollutant concentrations would be well below the ambient air quality standards. Since no substantial increases in air pollution emissions

Table 5.1-12 Summary of NTS construction emissions and mobile source emissions (on site and off site), tons per year, Alternative 1

Program	Construction	Mobile Sources								
		On Site			Off Site					
					Nye County			Clark County		
	Fugitive PM_{10}[a]	CO[b]	VOC[c]	NO_x[d]	CO	VOC	NO_x	CO	VOC	NO_x
Defense	Negligible	53.63	7.29	9.55	16.69	2.52	5.90	32.40	4.89	11.44
Waste Management	0.00	9.10	1.24	1.62	2.83	0.43	1.00	5.50	0.83	1.94
Environmental Restoration	220	14.13	1.92	2.52	4.40	0.66	1.55	8.53	1.29	3.01
Nondefense Research and Development	0.00	6.94	0.94	1.24	2.16	0.33	0.76	4.20	0.64	1.48
Work for Others	0.0	12.69	1.72	2.26	3.95	0.60	1.40	7.66	1.16	2.71
Site-Support Activities	NA[e]	142.93	19.42	25.45	44.49	6.72	15.71	86.36	13.05	30.49
Total	**220**	**239.42**	**32.53**	**42.64**	**74.52**	**11.26**	**26.32**	**144.65**	**21.86**	**51.07**

[a] PM_{10} = particulate matter with a diameter equal to or less than 10 micrometers
[b] CO = carbon monoxide
[c] VOC = volatile organic compounds
[d] NO_x = nitrogen oxides
[e] NA = not applicable

Table 5.1-13. Site-support activities stationary source emissions at the NTS and Nye County, tons per year, Alternative 1

Area	TSP[a]	SO_2[b]	NO_x[c]	HC[d]	CO[e]
Area 1	34.7	3.40	2.20	0.10	0.50
Area 2	87.3	0.0	0.0	0.0	0.0
Area 3	24.37	0.0	0.0	0.0	0.0
Area 6	11.7	2.90	4.10	0.0	0.0
Area 23	1.12	10.62	9.4	0.0	2.54
U.S. DOE Portable[f]	17.68	15.24	229.32	0.0	49.68
Fuel Storage Tanker	0.0	0.0	0.0	31.95	0.0
Total NTS	**176.87**	**32.16**	**245.02**	**32.05**	**52.72**
Total Nye County	**1,685.70**	**960.68**	**933.28**	[g]	**187.68**

[a] Total suspended particulates
[b] Sulfur dioxide
[c] Nitrogen oxides
[d] Hydrocarbons
[e] Carbon monoxide
[f] Compressors
[g] No data; state hydrocarbon emission inventory is not complete.

Source: Bureau of Air Quality, State of Nevada, 1995.

are expected at the NTS by 2005, Nye County would continue its present attainment designation for all criteria pollutants. The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

Mobile source emissions in Nye County (on-site and off-site) and Clark County are presented in Table 5.1-12. These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations in Nye County above ambient standards. Therefore, Nye County would continue to maintain its attainment designation for all criteria pollutants. The NTS contribution to mobile source emissions in Clark County would continue to be very small. The carbon monoxide, volatile organic compounds, and nitrogen dioxide pollutant emissions from NTS mobile sources in Clark County contribute 0.11, 0.10, and 0.41 percent, respectively, to the Clark County pollutant burden. The small contribution to the carbon monoxide burden in Clark County would not produce additional violations of the carbon monoxide ambient air quality standard.

GENERAL CONFORMITY DETERMINATION—The EPA published the General Conformity Rule (40 CFR Parts 6, 51, and 93) to implement Section 176 (c) of the Clean Air Act as amended in 1990. This section requires that federal actions conform to the appropriate State Implementation Plan. Conformity, as defined in the Clean Air Act, is conformity to the State Implementation Plan's purpose of eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards and achieving expeditious attainment of such standards. A formal conformity determination is required for federal actions occurring in nonattainment areas when the total direct and indirect emissions of nonattainment pollutant (or their precursors) exceed specified annual de minimis (threshold) values. Because ozone (O_3) is a secondary pollutant, the conformity determination for ozone uses the precursor

emissions of volatile organic compounds and nitrogen dioxide (NO_2) as surrogate pollutants. The de minimis thresholds are presented in Table 5.1-14.

The mobile-source emissions for Clark County shown in Table 5.1-12 are based on commuter traffic traveling on U.S. Highway 95 between Las Vegas and the NTS. Approximately 40 percent of this highway is located in the Las Vegas Valley nonattainment area for carbon monoxide and PM_{10}.

Thus, the annual emissions of carbon monoxide (CO) in the nonattainment area would be 57.9 tons. This is well below the 100 ton per year de minimus shown for carbon monoxide in Table 5.1-14. Therefore, a general conformity analysis would not be required for this alternative.

RADIOLOGICAL AIR QUALITY—Air concentrations would have to be 14 times higher than the measured 1993 average concentrations to achieve the maximum CAP-88 air dose assessment modeled dose (see Section 4.1.7). Effluents from the five programs are estimated at concentration levels that would never approach or even begin to approach this amount; therefore, it is expected that impacts to the air quality by radioactive effluents would be minimal under Alternative 1. The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

5.1.1.8 Noise. Noise generated on the NTS does not propagate off site at audible levels. The closest sensitive receptors to the site boundary would be residences located 2 km (1.3 mi) to the south in the town of Amargosa Valley (Lathrop Wells). Therefore, NTS noise impacts under Alternative 1 would be a result of noise generated during the operation of construction equipment and from the transportation of personnel and materials to and from the site. The NTS total construction and operations workforce with this alternative would remain relatively constant through the 1996 to 2005 period.

Railroad and aircraft noise were considered. However, there are no railroads serving the NTS; therefore, a railroad noise impact analysis was not required. Based on composite noise contours developed by the U.S. Air Force in 1994 for subsonic and supersonic flight operations over the Nellis Air Force Range Complex (U.S. Air Force, 1994), the day-night average sound level (L_{dn}) in the NTS portion of the complex resulting from aircraft operations would be less than 50 decibels (dB). Flight operations at supersonic speeds are not authorized over the NTS (SAIC/DRI, 1991), and subsonic operations are not normally scheduled over

Table 5.1-14. De minimis thresholds in nonattainment areas

Criteria Pollutant	Degree of Nonattainment	Tons/Year
Ozone (VOCs and NO_2)	Serious	50
	Severe	25
	Extreme	10
	Other ozone nonattainment areas (outside of ozone transport region)	100
Volatile Organic Compounds (VOCs)	Marginal/moderate nonattainment (within ozone transport region)	50
NO_2	Marginal/moderate nonattainment (within ozone transport region)	100
Carbon monoxide (CO)	All	100
Particulate matter (PM_{10})	Moderate	100
	Serious	70
Sulfur/nitrogen dioxide (SO_2/NO_2)	All	100
Lead (Pb)	All	25

the eastern portion of restricted area R-4808, which includes most of the NTS (U.S. Air Force, 1994). Only periodic helicopter and small fixed-wing aircraft operations are conducted from Desert Rock Airport.

Defense Program. Transportation noise levels on the NTS would be minimal and would not produce any noise impacts off site, contributing less than 3 a-weighted sound level (dBA) to the overall traffic noise levels on U.S. Highway 95. Thus, noise impacts related to Defense Program activities would be considered minor and not significant. Noise levels associated with the conduct of multiple tests would be sporadic and transitory.

Waste Management Program. Waste Management Program activities under Alternative 1 would continue to include the disposal of low-level waste and mixed waste pits or trenches. The preparation of the disposal cells requires the use of some construction equipment. These construction activities would be intermittent. Noise levels would decrease with distance and would be barely distinguishable from background noise levels at the NTS boundary.

The delivery of waste to the site by large trucks would produce some on-site and off-site traffic noise. However, the number of vehicles would average only 10 to 15 per working day. This small number of vehicles would contribute only minor amounts of noise to the overall noise levels on U.S. Highway 95. Therefore, the noise levels produced by Waste Management Program activities under this alternative would produce only minor noise impacts, both on site and off site.

Environmental Restoration Program. Environmental Restoration Program activities would require the removal and disposal of contaminated soils and the drilling of characterization wells. The equipment required to perform these activities would generate noise at environmental restoration areas. The noise levels would decrease with distance. At the NTS boundary, the noise levels would be barely distinguishable from background noise levels. For example, the noise level 15 m (50 ft) from a drill rig would be about 90 dBA. At a distance of 1.6 km (1 mi), the noise level would be 50 dBA, and at a distance of 3.2 km (2 mi), the noise level would be about 44 dBA.

Removal of the contaminated material from the NTS by trucks would produce a minor contribution to on-site and off-site noise levels generated by traffic on U.S. Highway 95. Therefore, the noise levels produced by Environmental Restoration Program activities under this alternative would produce only minor noise impacts, both on site and off site.

Nondefense Research and Development Program. The only activity in the Nondefense Research and Development Program that would generate noise is the continued operation of a wind tunnel at the Spill Test Facility. The wind tunnel operation is infrequent, and local noise levels would decrease with distance. The noise from this source would be barely distinguishable from background noise levels at the NTS boundary. Transportation noises for the Nondefense Research and Development Program would be minor, both on site and off site. Therefore, noise impacts from these programs would be negligible.

Work for Others Program. Included in the Work for Others Program are activities that include periodic military training exercises. These exercises include the operation of fixed and rotary wing aircraft in the NTS airspace. Noise levels resulting from these operations would produce local noise levels of 80 to 90 dBA. However, these noise levels would decrease with distance. Because of the large size of the NTS, noise levels from these activities would be barely audible at the NTS boundaries. Noise impacts would be minor.

Site-Support Activities. Transportation noise levels on the NTS would be minimal and would not produce any on-site or off-site noise impacts.

5.1.1.9 Visual Resources. An analysis has been conducted to determine the effects of Alternative 1 on visual resources. Visual impacts were assessed on the potential of Alternative 1 to alter or conflict with the existing landscape character. An impact to

visual resources would be considered adverse and potentially significant if the contrasts and sensitivity levels of the viewpoints were unacceptably high. Appendix A provides related information regarding proposed facilities and activities that would affect visual resources at the NTS. The only activities that could affect visual resources would be from the Environmental Restoration Program. The other programs would not create new ground disturbance.

The Environmental Restoration Program activities would be located in areas of scenic quality common to the region, and none would be visible from public viewpoints. Depending on pertinent reclamation factors, disturbed areas could be revegetated after remediation has been completed. Long-term impacts would be negligible. There would be some beneficial impacts to visual resources once vegetation is re-established.

5.1.1.10 Cultural Resources. There would be impacts to cultural resources as a result of ground-disturbing activities, building modifications, and change to setting through increased noise, lighting, and construction in previously undisturbed locations. Impacts to cultural resources could occur through underground testing, drilling, grading, fencing, explosives-producing subsidence craters; cleanup activities (contaminated soils, effluent ponds and inactive tanks), construction of buildings, water systems, lights, wells, upgrading power lines, natural gas lines, roads, and the decontamination of buildings. A total of 9,905 acres are expected to be disturbed, but impacts to significant cultural resources are unlikely. Continued visitation and vehicular traffic could lead to vandalism or artifact collecting that could indirectly affect recorded archaeological sites and archaeologically sensitive areas.

Although archaeological surveys have not been conducted in those areas, it is estimated that 67 sites could be impacted by projects associated with this alternative based on the results of archaeological surveys conducted in adjacent areas in 1994. The precise location and number of these resources are unknown until archaeological surveys are conducted. Surveys will be conducted prior to ground-disturbing activities, and impacts will be mitigated through the measures described in Chapter 7. At least eight structures will be decommissioned under Alternative 1. If these buildings are determined to be historically significant, they would be mitigated using measures described in Chapter 7.

Defense Program. Under Alternative 1, the DOE would maintain readiness to perform one nuclear test at the NTS. Although it is likely that this test would be performed in a disturbed area, the excavation and preparation of the test area, if in a previously undisturbed area, could adversely affect archaeological resources.

Some buildings in Area 4 may have historic significance related to the Cold War and nuclear development. Prior to any modification or destruction, these structures would be evaluated for their potential to provide historical information. No nuclear testing, stockpile management activities, or nuclear weapons storage projects are scheduled for Area 13 on the NAFR Complex. Therefore, these projects of the Defense Program would not impact cultural resources.

Waste Management Program. Under this alternative, the Area 3 Radioactive Waste Management Site facility would be sufficient to handle forecasted waste volumes for the next 10 years. With the same level of activity, this program would present no increased potential for impact on cultural resources.

At the Area 5 Radioactive Waste Management Site, existing facilities would be full before 10 years. It is estimated that one additional trench within the currently operated site would be needed.

No DOE waste management storage facilities are currently located within the NAFR Complex. All such facilities are located on the NTS, and any Waste Management Program activities pertaining to the NAFR Complex would involve removal of contaminated soils to the NTS. Therefore, the Waste Management Program would have no impact on cultural resources within the NAFR Complex.

Environmental Restoration Program. Environmental Restoration Program activities at the NTS would occur mainly on previously disturbed

land. However, well construction, to monitor groundwater contamination, could impact cultural resources in undisturbed areas.

Under Alternative 1, eight structures will be decommissioned at the NTS. Two of these structures have been determined to be eligible for the National Register of Historic Places. These include the EPA Farm and the Junior Hot Cell facility. Data recovery at the Junior Hot Cell facility has been completed and the building has since been demolished. Other structures, as yet unevaluated, may be eligible. These structures will be evaluated and if eligible, they will be mitigated using the measures described in Chapter 7.

Few sites have been recorded directly within the area of potential effect for Area 13. However, much of the area has not been surveyed for cultural resources. Archaeological sites have been recorded in the general area, and indirect impacts to these sites could occur as a result of increased visitation to the site area.

Nondefense Research and Development Program. Most of the DOE's Nondefense Research and Development Program projects are located at the NTS. These projects are related to the development of solar generation facilities. If located in previously undisturbed areas, ground disturbance from construction could impact cultural resources. These programs would have no effect on the cultural resources found in the vicinity of the Area 13 site.

Work for Others Program. The DOE's Work for Others Program is focused on the NTS and would be located within existing facilities. Therefore, there would be no impact to significant cultural resources at the NTS. This program would have no effect on the cultural resources found in the vicinity of the Area 13 site.

Site-Support Activities. Site-support activities could impact cultural resources through ground disturbances associated with upgrading roads, utilities, power lines, and communication facilities.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CTGO.

The CTGO knows that the actions considered in the NTS EIS potentially will affect American Indian cultural resources within an area roughly bounded by where these people live today in their traditional lands (Figure 4-47). The proposed NTS EIS actions will have cultural effects within this region of influence because of the cultural centrality of these lands to all three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiutes). Within this region of influence, specific actions will have direct local impacts. Ultimately, however, any action that moves the NTS away from or back towards its natural state has influence on all the Indian people.

The CTGO recognizes that some of the actions proposed in the NTS EIS will have direct impacts on other Indian tribes and organizations. For example, the Project Shoal Area is located on the traditional lands of the Northern Paiute people. The Eldorado Valley actions potentially impact the Mohave people. The return of radioactive waste to the NTS has permitted and potentially will permit people like the Alaskan natives to have their lands restored to a natural state (see Project Chariot Report [DOE/NV, 1994b]). Therefore, the CTGO defines the American Indian region of influence map in an effort to focus on the cultural concerns of those people having traditional ties to the NTS itself, but, in so doing, does not intend to preclude the cultural concerns of other Indian ethnic groups.

Defense Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further underground nuclear tests occur and if natural lands are scraped for construction. Access to culturally significant places will be reduced because Indian people's perception of health and spiritual risks will increase if additional testing, storage, disassembly, or disposal of nuclear and conventional weapons occurs.

Waste Management Program at NTS—Under Alternative 1, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted by the well monitoring program and the construction of access roads, but will be positively impacted by actions that return disturbed lands to their natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted by increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals. Cultural resources could be positively impacted if students and researchers receive proper guidance by Indian people regarding how to visit places and interact with the environment.

Work for Others Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the NTS continued to be a place where weapons are stored, disassembled, and disposed. These actions have and will continue to pollute these lands. The presence of conventional and nuclear weapons defines the NTS as a place of destruction, which promotes an image that is inappropriate as a place for peaceful relations between Indian ethnic groups.

American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Defense Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further nuclear safety tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program at Area 13 on the NAFR Complex and none has been identified for this alternative.

Environmental Restoration Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources at Area 13 on the NAFR Complex will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if Area 13 on the NAFR Complex continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Work for Others Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if Area 13 on the NAFR Complex continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.1.1.11 Occupational and Public Health and Safety. For workers at the NTS, occupational health and safety impacts could result from industrial safety hazards in the workplace (e.g., injuries or fatalities from construction and maintenance), controlled exposure to radiation or hazardous chemicals in the workplace, and accidental exposures to radiation or hazardous chemicals. Impacts to worker health could take the form of injuries or fatalities from industrial hazards and cancer fatalities, or other detrimental health effects from exposure to radiation or hazardous chemicals. Table 5.1-15 summarizes the occupational and public health and safety impacts for each NTS program area under Alternative 1.

Table 5.1-15. Health risks to workers and the public from program activities, NTS, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense (with nuclear testing)	6.8	0.012	0.032 (0.034)	0.012 (0.013)	e e	e e	4.0×10^{-6} (0.0054)	1.8×10^{-6} (0.0025)	e e	e e
Waste Management	153	2.9	0.020	0.0081	5.2×10^{-5}	0.48	5.1×10^{-5}	2.3×10^{-5}	2×10^{-5}	3.8×10^{-6}
Environmental Restoration	10	0.031	0.0085	0.0034	3.0×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6×10^{-6}	2.4×10^{-6}
Nondefense Research and Development	1.9	0.0033	0.0031	0.0013	3.2×10^{-6}	0.58	f	f	1.9×10^{-4}	1.5×10^{-4}
Work for Others	11	0.019	0.0055	0.0022	6.1×10^{-5}	4.4×10^{-3}	f	f	2.9×10^{-7}	1.9×10^{-8}
Site-Support Activities	19	0.033	0.046	0.018	e	e	f	f	e	e
Total (with nuclear testing)	**202**	**3**	**0.12 (0.15)**	**0.045 (0.058)**	**4.1×10^{-6}**	**0.58**	**5.5×10^{-5} (0.0055)**	**2.5×10^{-5} (0.0025)**	**2.3×10^{-4}**	**1.5×10^{-4}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
f. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified

The remote location of the NTS insulates impacts to the general public from NTS activities. To impact public health and safety, there must be a pathway or a transport mechanism to transmit the hazard to the public. For NTS activities, the principal pathways by which the public could be exposed to hazards are air, groundwater, and motorized transport. Potential impacts to the public from routine airborne emissions of radioactivity and priority pollutants are discussed in Section 5.1.1.7, Air Quality.

Transportation impacts are discussed in Section 5.1.1.2, Transportation. This section addresses potential impacts to public health and safety from subsurface contamination of groundwater and from accidental releases of radioactivity to the air. Unless otherwise noted, impacts presented in this section are the total impacts for the 10-year period evaluated in this EIS. Results are presented for each program area, although some program areas do not involve hazards from radiation or hazardous chemicals.

Defense Program. Based on occupational injury and fatality rates for construction and other industrial activities, the Defense Program at the NTS is expected to result in 3.7 injuries to workers during routine program activities and 3.1 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.0066 fatalities are expected from routine activities, and 0.0055 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Defense Program workers of about 78 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.031 latent cancer fatalities and 0.012 other detrimental health effects in the worker population. Risk of accidental exposure to workers increases the latent cancer fatality risk by 0.001. No Defense Program hazardous chemical accident resulting in measurable effects at the NTS has been identified.

The health and safety impact to the public from potential Defense Program accidents could result in about 4.0×10^{-6} latent cancer fatalities and 1.8×10^{-4} other detrimental health effects in the population. Should the DOE be directed by the President to conduct underground nuclear-yield testing under Alternative 1, potential accidents associated with venting of radionuclides following a test could result in a risk of about 0.0054 latent cancer fatalities and 0.0025 other detrimental health effects in the population.

Subsurface radioactivity from past underground nuclear weapons tests potentially provides an exposure pathway for both NTS workers and the public. Transport modeling of tritium-contaminated groundwater from underground test areas at Pahute Mesa and Yucca Flat was performed in support of this EIS (GeoTrans, 1995). An earlier screening study by Daniels et al. (1993) also evaluated tritium migration from Pahute Mesa to Oasis Valley. The modeling results showed that tritium concentrations in groundwater are never expected to reach concentrations that are above the EPA's maximum allowable tritium concentration in drinking water which is 20,000 picocurie per liter (pCi/L) at the boundaries of the NTS or NAFR Complex. To date, only low levels of tritium have been detected in any on-site wells.

Health effects impacts to the public from subsurface radioactivity have been estimated based on future predictions of tritium concentrations in well water, even though predicted concentrations are below current limits of detection. These impacts are not expected to occur within the 10-year time frame of this EIS. The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-17} (about one in one trillion) and 1×10^{-5} (about one in 100,000). The public exposure scenario assumes that the individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water.

No health effects impacts to NTS workers from subsurface radioactivity are expected to occur during the 10-year time period evaluated in this EIS. Tritium is not detectable in on-site drinking water wells. Existing monitoring programs and controls

preclude inadvertent consumption of contaminated well water by workers.

The maximum reasonably foreseeable radiological Defense Program accident at the NTS would be a non-nuclear explosion involving high explosives in an Area 27 nuclear weapons storage bunker, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 62,000 rem (2,700 rem in first year after exposure), acute radiation effects could result in fatality without immediate medical treatment
- Non-involved worker population at the nearest major facility area: 16,000 person-rem, 6.4 latent cancer fatalities, 2.6 other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 34 rem, 3.4×10^{-2} chance of latent cancer fatality, 1.6×10^{-2} chance of other detrimental effects
- Population within 80 km (50 miles): 5,800 to 110,000 person-rem, 3 to 55 latent cancer fatalities, 1 to 25 other detrimental effects.

No Defense Program accident resulting in measurable chemically hazardous effects at the NTS has been identified.

Waste Management Program. Based on occupational injury and fatality rates for construction and other industrial activities, the Waste Management Program at the NTS is expected to result in 150 injuries to workers during routine program activities and 2.8 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 2.9 fatalities are expected from routine activities, and 0.005 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Waste Management Program workers of about 11 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0043 latent cancer fatalities and 0.0017 other detrimental health effects in the worker population.

The risk of accidental exposure increases the latent cancer fatality risk by 0.016 and the detrimental health effect risk by 0.0064. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Waste Management Program hazardous chemical accidents has a hazard index of 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents could result in about 5.1×10^{-5} latent cancer fatalities and 2.3×10^{-5} other detrimental health effects in the population. Waste Management Program accidents involving hazardous chemicals could result in about 2.0×10^{-5} cancers in the population. No noncancer effects from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6×10^{-7} (1 in 1,700,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash
- Maximally exposed non-involved worker: 3,500 rem (154 rem in first year after exposure), 1.0 chance of latent cancer fatality, 1.0 chance of other detrimental effects

- Non-involved worker population at the nearest major facility area: 99 person-rem, 0.04 chance of a single latent cancer fatality, 0.016 chance of other detrimental effects

- Maximally exposed off-site individual at the nearest point of public access: 3.5 rem, 1.8×10^{-1} chance of latent cancer fatality, 8.0×10^{-3} chance of other detrimental effects

- Population within 80 km (50 mi): 1,400 to 25,000 person-rem, 1 to 13 latent cancer fatalities, 0 to 6 other detrimental effects.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into the Area 5 hazardous waste storage unit, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash

- Maximally exposed non-involved worker: 6.6×10^{-2} chance of cancer, 340 noncancer hazard index for potentially life-threatening one-hour concentration

- Non-involved worker population at the nearest major facility area: 1.1×10^{-3} chance of a single cancer, 0.09 noncancer hazard index for potentially life-threatening one-hour concentration

- Maximally exposed off-site individual at the nearest point of public access: 2.4×10^{-5} chance of cancer, 0.013 noncancer hazard index for potentially life-threatening one-hour concentration

- Population within 80 km (50 mi): 0.027 to 0.10 chance of a single cancer, 0.005 to 0.01 noncancer hazard index for potentially life-threatening one-hour concentration.

The long-term effects of waste disposal operations are being evaluated as a part of the performance assessment process discussed in Appendix A, Section A.2; Chapter 2, Section 2.5.6; and Chapter 4, Section 4.1.5.2. As part of the performance assessment process, scenarios have been developed to evaluate the potential for public exposure to radionuclides from the disposed waste. Considered in these scenarios are the transport of radionuclides by air, surface water, groundwater, and human intrusion pathways. Preliminary results of the Area 5 Radioactive Waste Management Site Performance Assessment (Shott et al., 1995) indicate that the potential risk/exposure from waste disposal activities through the surface water and air pathways is not significant over thousands of years. Based on the results of field studies, the groundwater pathway is not considered a credible transport mechanism. The limiting scenario identified in the Area 5 performance assessment is the intruder scenario. The intruder scenario is postulated to occur thousands of years in the future, when areas previously used for waste disposal would be mined or farmed. The significant exposure results from a person living on the former waste disposal site consuming food and water (assumed to be contaminated) for a lifetime. The results of the very conservative approach to estimating exposure is then used to establish design, operation, closure, and waste acceptance criteria for the waste management facilities. The performance assessment is a continual process that is used to improve the design and operation of DOE waste management facilities.

Environmental Restoration Program. Based on occupational injury and fatality rates for construction and other industrial activities, the Environmental Restoration Program at the NTS is expected to result in 8 injuries to workers during routine program activities and 2.2 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.027 fatalities are expected from routine activities, and 0.004 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Environmental Restoration Program workers of about 21 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological

Protection (1991), this dose could result in about 0.0085 latent cancer fatalities and 0.0034 other detrimental health effects in the worker population. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 2.8×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Environmental Restoration Program hazardous chemical accidents has a hazard index of 0.14.

The health and safety impact to the public from potential Environmental Restoration Program accidents could result in about 2.3×10^{-10} latent cancer fatalities and 1.1×10^{-10} other detrimental health effects in the population. Environmental Restoration Program accidents involving hazardous chemicals could result in about 1.6×10^{-5} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the NTS would be an airplane crash into the Area 13 site, which has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash
- Maximally exposed non-involved worker: 0.0011 rem, 4.4×10^{-7} chance of latent cancer fatality, 1.8×10^{-7} chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 0.0055 person-rem, 2.2×10^{-6} chance of a single latent cancer fatality, 8.8×10^{-7} chance of other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 0.0022 rem, 1.1×10^{-6} chance of latent cancer fatality, 5.1×10^{-7} chance of other detrimental effects
- Population within 80 km (50 mi): 0.04 to 0.71 person-rem, 2.1×10^{-5} to 3.6×10^{-4} chance of a single latent cancer fatality, 9.4×10^{-6} to 1.6×10^{-4} chance of other detrimental effects.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS, which has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash
- Maximally exposed non-involved worker: 0.008 chance of cancer, 45 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 9.4×10^{-5} chance of a single cancer, 0.0097 noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 8.5×10^{-6} chance of cancer, 9.8×10^{-3} noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 1.5×10^{-3} to 3.3×10^{-3} chance of a single cancer, 6.1×10^{-4} to 6.5×10^{-4} noncancer hazard index for potentially life-threatening one-hour concentration.

Nondefense Research and Development Program. Based on occupational injury and fatality rates for construction activities, the Nondefense Research and Development Program at the NTS is expected to result in 1.9 injuries and 0.0033 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from routine program activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is

estimated to result in a collective dose to NTS Nondefense Research and Development Program workers of about 8 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0031 latent cancer fatalities and 0.0012 other detrimental health effects in the worker population. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 3.2×10^{-6}. The risk of life-threatening noncarcinogenic effects to a single worker from Nondefense Research and Development hazardous chemical accidents has a hazard index of 0.58.

The health and safety impact to the public from potential Nondefense Research and Development Program accidents could result in about 1.9×10^{-4} cancers in the population. No hazardous chemical noncancer effects to the public from chemical accidents would be expected to occur.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into the tank farm at the Spill Test Facility, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in crash
- Maximally exposed non-involved worker: 1.0 chance of cancer, 1,000 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 0.054 chance of a single cancer, 0.80 noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 8.8×10^{-5} chance of cancer, 0.34 noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 0 to 3 cancers, 0.01 to 0.19 noncancer hazard index for potentially life-threatening one-hour concentration.

Work for Others Program. Based on occupational injury and fatality rates for construction activities, the Work for Others Program at the NTS is expected to result in 11 injuries and 0.019 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from routine program activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Work for Others Program workers of about 14 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0055 latent cancer fatalities and 0.0022 other detrimental health effects in the worker population. No Work for Others Program accident resulting in measurable radiological effects at the NTS has been identified. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 6.1×10^{-8}. The risk of life-threatening noncarcinogenic effects to a single worker from Work for Others Program hazardous chemical accidents has a hazard index of 0.004.

The health and safety impact to the public from potential Work for Others Program accidents could result in about 2.9×10^{-7} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

For Work for Others Program hazardous chemical effects, the maximum reasonably foreseeable accident would be a heavy metal release as a result

of an unplanned detonation of a test assembly at the Big Explosives Experimental Facility, which has a probability of occurrence of 1×10^{-2} (1 in 100) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 1.8×10^{-4} chance of cancer, 0.044 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 6.1×10^{-7} chance of a single cancer, 4.0×10^{-6} noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 1.4×10^{-9} chance of cancer, 1.9×10^{-7} noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 2.9×10^{-6} to 1.3×10^{-7} chance of a single cancer, 1.9×10^{-7} noncancer hazard index for potentially life-threatening one-hour concentration.

Site-Support Activities. Site-support activities are distributed among the five major program areas. Site-support activities at the NTS are expected to result in 19 injuries and 0.033 fatalities as a result of construction activities during the 10-year period evaluated in this EIS. No injuries or fatalities are projected as a result of routine site-support activities. Occupational exposure to radiation is expected to result in a collective dose to NTS site-support workers of about 115 person-rem in 10 years. This dose could result in about 0.046 latent cancer fatalities and about 0.018 other detrimental health effects in the worker population.

Perceptions of radiation effects are discussed in Section 4.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians' perceptions of risks. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and why we will continue to respond to future DOE activities.

5.1.1.12 Environmental Justice. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations. Analysis of Environmental Justice is based on geographic distribution of low-income and minority populations in Clark, Nye, and Lincoln counties as described in Section 4.1.12.

Environmental Justice analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and

adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations.

To determine whether human health effects are adverse and disproportionately high, the following factors were considered:

- Whether the health effects, which may be measured in risks and rates, are significant, unacceptable, and above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death

- Whether the risk or rate of exposure by a minority population or low-income population to an environmental hazard is significant and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population

- Whether health effects occur in a minority population or low-income population affected by total or multiple adverse exposures from environmental hazards.

To determine whether environmental effects are adverse and disproportionately high for low-income and minority communities, the following three factors were considered to the extent practicable:

- Whether there is an impact on the natural or physical environment that significantly and adversely affects a minority community or low-income community

- Whether environmental effects are significant and are having an adverse impact on minority population or low-income populations that appreciably exceeds or is likely to exceed appreciably those in the general population or other appropriate comparison group

- Whether the environmental effects occur in a minority population or low-income population affected by total or multiple adverse exposure from environmental hazards.

To identify the need for ensuring protection of populations with differential patterns of subsistence consumption of fish and wildlife, whenever practicable and appropriate, information of the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence was analyzed. Differential patterns of consumption of natural resources relates to subsistence and differential patterns of subsistence, and means differences in rates and/or patterns of fish, water, vegetation, and/or wildlife consumption among minority populations or low-income populations, as compared to the general population. Subsistence consumption of fish and wildlife means dependence by a minority population or low-income population or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of its diet (CEQ, 1995). No such populations have been identified in the region of influence.

The CGTO has identified impacts to American Indian groups as a result of Alternative 1. The Yomba Shoshone tribe, the Moapa Paiute tribe, the Las Vegas Paiute tribe, the Pahrump tribe, and the Las Vegas Indian Center are all part of the CGTO and are all located in Clark, Nye, or Lincoln counties. In addition, while not physically located in Clark, Nye, or Lincoln counties, other groups have traditional ties to the NTS and surrounding areas. All American Indian groups in the American Indian region of influence (Figure 4-48) would be equally affected. Figure 4-48 does not imply that groups located closer to the NTS are more concerned about impacts than groups that live farther away. Impacts include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. These impacts would be perceived only by American Indian groups and would, therefore, be a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

The CGTO knows that the actions considered in the NTS EIS potentially will disproportionately affect American Indian people. As discussed in Section 5.1.1.10, Cultural Resources, and Section 5.1.1.11, Occupational and Public Health and Safety, the American Indian impacts include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations.

The effects of Alternative 1 on American Indian Environmental Justice issues are discussed below by program.

Defense Program at the NTS—Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if defense activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Waste Management Program at the NTS—Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if waste management activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Environmental Restoration Program at the NTS—Under Alternative 1, it is expected that all three American Indian Environmental Justice issues would occur. Holy Land violations can be reversed when a portion of traditional land and its resources are returned to the Indian people by eliminating contamination and restoring surface disturbance areas with traditional Indian plants and animals. Perceived risks potentially can be reduced when radioactivity is reduced by the physical and spiritual restoration of the NTS. Cultural survival impacts will reverse if environmental restoration activities increase the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Nondefense Research and Development Program at the NTS—Under Alternative 1, it is expected that all three Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people whether this occurs by contamination or use by students and researchers. Perceived risks will not increase unless more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if research and development activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Work for Others Program at the NTS—Under Alternative 1, it is expected that all three Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity or hazardous waste is brought to or created at the NTS. Cultural survival impacts will occur if military training exercises and weapons tests reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

5.1.2 Tonopah Test Range

Under Alternative 1, the Defense, Environmental Restoration, and Work for Others Programs at the Tonopah Test Range would continue in the same manner and degree as they have within the past three to five years. The activities associated with Alternative 1 are summarized below. A more detailed description of the activities is presented in Appendix A.

Defense Program. Under Alternative 1, Tonopah Test Range activities associated with stockpile stewardship would continue. Impact, passive, and chemical testing would also continue.

Environmental Restoration Program. Environmental Restoration Program activities would continue at current rates.

Work for Others Program. Current Work for Others Program activities would continue at the Tonopah Test Range. Activities include treaty verification, nonproliferation projects, counterproliferation projects, conventional weapons demilitarization, and defense research and development.

Site-Support Activities. Site-support activities under Alternative 1 would remain at the existing level of approximately 150 personnel. Routine maintenance would continue to be provided to keep existing equipment and utilities functional.

5.1.2.1 Land Use. The DOE land uses under Alternative 1 would continue in the same manner and degree as in the past. This would continue the restriction on all non-federal agency uses. As a consequence, few of the traditional multiple uses for this type of land would be permitted. Undeveloped areas would continue to function as wildlife and wild horse habitat, while the industrial areas would continue in that type of land use. Past aerial bombing and gunnery activities, which have resulted in ordnance contamination of land areas, may have made it impossible to certify that decontamination is complete. The Secretary of the Interior can either accept or decline relinquished lands on the NAFR Complex.

Defense Program. Defense Program activities would continue to take place in already disturbed test beds and training areas. All ordnance or hardware would continue to be recovered following use. No new areas would be altered as a result, and land-use options would remain the same.

Environmental Restoration Program. On the Tonopah Test Range, 3 nuclear device safety test sites and 43 known industrial sites are scheduled for characterization and remediation. Presently, the safety test sites are fenced and completely restricted from use. Remediation of the safety test sites would result in their having a lessened degree of restriction on land uses. Depending on the cleanup level agreed upon between the state of Nevada and the DOE, these sites would be available for a greater unrestricted variety of other land uses. For the industrial sites that are remediated, fewer or no restrictions on alternative land uses would occur, depending on whether closure in place or clean closure is selected as the remediation measure.

Work for Others Program. Work for Others Program activities would continue to take place in already disturbed test beds and training areas. Other, noncompatible uses would be precluded, but no long-term restrictions on future land-use options would result.

5.1.2.1.1 Site-Support Activities—Under Alternative 1, the facilities associated with support functions and services at the Tonopah Test Range would continue to be maintained and used at approximately the current level. Site-support services such as law enforcement and security, fire protection, and health care would continue to operate at existing levels. The water and electrical systems would remain; general maintenance and upgrades would occur as required to ensure safe operations. The wastewater systems would remain in service with only regular maintenance and minor improvements as required to ensure adequate services to the users at the Tonopah Test Range. All solid waste disposal activities would continue to operate at current levels. Hazardous and low-level waste would continue to be transported off site for disposal. Under Alternative 1, the communication systems at the Tonopah Test Range would remain

operational and be maintained for all current administrative and testing operations.

5.1.2.1.2 Airspace—It is estimated that there would be an increase of DOE sorties at a rate of 2 percent per year. As a result, the estimated sorties flown by the DOE in 2000 would exceed 18,000 per year.

The effect on civil aviation is keyed primarily to constraints on routes of flights because of defense-related airspace. The Tonopah Test Range is landlocked within the NAFR Complex, and its airspace is controlled by the surrounding airspace restrictions. Civilian aviation flights are generally restricted from crossing the surrounding airspaces, thus occurrences within Tonopah Test Range airspace would have little potential to impact civilian flights. Under Alternative 1, an increase in flying time between some commercial airports would remain. However, under this alternative, the current level of air traffic control and navigational aid services, as well as airspace structure, would be maintained. Activities under Alternative 1 are not expected to cause an increased delay in civilian air traffic. No new impacts to airspace are anticipated from the continuation of current activities.

5.1.2.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.2.2.1 On-Site Traffic—Under Alternative 1, on-site traffic levels would remain at approximately the current levels. Therefore, no impacts to on-site traffic would occur as a result of Defense, Environmental Restoration, or Work for Others Programs. Site-support activities would not result in impacts to on-site traffic under Alternative 1.

5.1.2.2.2 Off-Site Traffic—Under Alternative 1, off-site traffic levels would remain at approximately current levels.

Defense Program. Approximately 50 employees would travel to the Tonopah Test Range to support Defense Program activities under this alternative. The main regional access to the Tonopah Test Range would continue to be U.S. Highway 6, which is currently underused. Given the number of trips associated with the Tonopah Test Range Defense Program, U.S. Highway 6 would still have a level of service A. Therefore, no significant impacts would occur.

Environmental Restoration Program. Under Alternative 1, the Environmental Restoration Program at the Tonopah Test Range would generate only an occasional, and minor, amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). Therefore, under Alternative 1, there would be no traffic impacts on off-site roadways.

Work for Others Program. The Work for Others Program is anticipated to generate less than 100 vehicle trips per day on the local access roads and U.S. Highway 6 near Tonopah. The average daily traffic on U.S. Highway 6 is far below capacity at this location. Therefore, there would be no traffic impacts on off-site roadways.

Site-Support Activities. Site-support activities and personnel would not significantly impact off-site roadways.

5.1.2.2.3 Transportation of Materials and Waste—Under Alternative 1, all materials would be delivered to the Tonopah Test Range by commercial carrier, government contractor, government vehicles, or, in the case of special nuclear material, special courier or airlift. The Tonopah Test Range would not be used for disposal of waste. Therefore, all waste would be transported off site for disposal.

Defense Program. Defense Program activities would require the transportation of special nuclear materials and weapons components in safe-secure trailers. Based on the limited testing of components from ground to air at the Tonopah Test Range, the total number of shipments is estimated to be five per year. The average transportation mileage for all safe-secure trailer shipments to the Tonopah Test Range is 24,140 km/yr (15,000 mi/yr).

The DOE evaluated and reported the risks associated with transporting Defense Program materials in a Defense Program transportation risk assessment (see Appendix I). Conclusions from the risk assessment indicated that a transportation accident having serious consequences along many identified routes is estimated to have a probability of less than or equal to one in a million. Under Alternative 1, transportation of materials and waste would remain at the current level. Therefore, no new impacts are anticipated under this alternative.

Environmental Restoration Program. Required remediation levels for contaminated soils located at the Tonopah Test Range are uncertain. As a result, the number of waste shipments to be sent from the Tonopah Test Range to the NTS is uncertain.

Work for Others Program. Under Alternative 1, no significant impacts would occur as a result of the transportation of materials and waste with this program.

Site-Support Activities. Site-support activities would not require the transport of materials and waste. Therefore, no impacts would occur.

5.1.2.4 Other Transportation—Approximately half of the workforce at the Tonopah Test Range would continue to be transported to the site by airlift on a daily basis. Equipment and supplies would also continue to be transported to the site by airlift.

5.1.2.3 Socioeconomics. The socioeconomic analysis has been performed for the region of influence of Clark and Nye Counties, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.1.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.1.2.4 Geology and Soils. The impacts to geology and soils resulting from the three programs and site-support activities are presented in this section.

Defense Program. Defense Program activities at the Tonopah Test Range would have an adverse impact to geologic media by excavation of the surface for installation of infrastructure or test activities. These projects are anticipated to impact 0.9 acres.

Several Defense Program projects have the potential to disturb and contaminate surface and subsurface geologic media. These projects are anticipated to impact approximately 640 acres, with fuel-air explosive operations accounting for greater than 99 percent of the area. Should remediation of contaminated geologic media not be implemented, and assuming that contaminants are long-lived, these media would be considered permanently lost.

Environmental Restoration Program. Environmental Restoration Program activities to restore the 964 acres of contaminated soils would make the surface vulnerable to short-term erosion by water or wind processes. Chemical stabilization and eventual revegetation would reduce erosion potential of disturbed areas.

Work for Others Program. The Work for Others Program activities would result in the same impacts as discussed for the Defense Program.

Site-Support Activities. No impacts from site-support activities would occur under this alternative.

5.1.2.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow.

5.1.2.5.1 Surface Hydrology—Little surface water is present on the Tonopah Test Range. Surface waters consist of small areas of seepage associated with Cactus Spring, a small sump associated with the Roller Coaster production well, a U.S. Air Force well that provides a small surface water source for wild horses, and ephemeral waters caused by summer convection storms and runoff during wet winters. No surface waters are used for water supplies. The ephemeral waters exist in normally dry washes for short periods of time and on the surfaces of usually dry lakes for periods of days to weeks. Water quality of the ephemeral waters is poor because of naturally high sediment loads and

dissolved solids. Activities could have minor effects on drainage patterns and discharge rates due to surface disturbance and altered infiltration rates. Change to sediment loads and dissolved solids due to project activities would be minor in comparison to the natural baselines. No significant change in water quality or quantity is anticipated, and, thus, the impacts are negligible.

Defense Program. Defense Program activities have some potential to impact the surface hydrologic environment at the Tonopah Test Range. The nature of the impact depends on the size and location of the activity.

One potential impact is contamination of the surface hydrologic environment resulting from weapons and burn tests. Some contaminants present in geologic media could be transferred to surface waters and transported downgradient to other soil areas.

Environmental Restoration Program. The restoration areas of the Tonopah Test Range that are contaminated with radionuclides from safety tests of nuclear weapons are all on the valley bottom and, in one case, a playa. Remediation would thus clean the lower and the terminal areas of the drainages. This would remove a source of potential contamination that ephemeral standing waters could pick up. Potential sources of surface water contamination would be removed during industrial site remediation.

Work for Others Program. Under Alternative 1, Work for Others Program activities are similar to Defense Program activities; therefore, the potential impacts to surface hydrology are similar.

Site-Support Activities. Under Alternative 1, site-support activities at the Tonopah Test Range are not expected to significantly impact surface waters.

5.1.2.5.2 Groundwater—Potential impacts to the groundwater from the programs and site-support activities are presented in this section.

Under Alternative 1, the potential impact on the water resources at the Tonopah Test Range include two broad types of effects: reduction in water resource availability and impact on water quality. The DOE routinely withdraws groundwater at the Tonopah Test Range that results in localized impacts, including a lowering of water levels, changes in groundwater flow direction, and reduction in quantity of water available to other users. If large-scale groundwater withdrawals occur, the impacts could increase to include reduction in spring discharge rates, water quality damage, and a reduction in underflow to downgradient areas.

Defense Program. Under Alternative 1, defense-related activities would be similar to those of the past three to five years. Therefore, no additional impacts are anticipated to the groundwater or water resources.

Environmental Restoration Program. Existing groundwater use by the Environmental Restoration Program would continue to be minimal and would be limited to that used for dust control, equipment decontamination, sanitation, and potable water for the workforce. Annual water requirements for characterization are expected to be minimal. Because of the limited demand for water, no significant adverse impacts on groundwater resources are anticipated as the results of Environmental Restoration Program activities at the Tonopah Test Range.

Work for Others Program. Under Alternative 1, adverse impacts to groundwater at the Tonopah Test Range would not occur.

Site-Support Activities. Under Alternative 1, site-support activities at the Tonopah Test Range are not expected to significantly impact the groundwater.

5.1.2.6 Biological Resources. Collectively, approximately 50 acres of undisturbed habitat would be disturbed by DOE or DOE-sponsored organizations under Alternative 1. No projects in Alternative 1 would be large enough that they would likely lower the viability of populations of any species. Therefore, it is unlikely that activities under Alternative 1 would influence biodiversity or ecosystem functions on or around the Tonopah Test Range.

Defense Program. There are 20 projects proposed for this site under this program. Eighteen of these projects involve testing of defense-related materials in previously disturbed areas. The projects are located in disturbed areas, and governing environmental protocols are followed. No biological impacts are likely to arise from these tests. Seismic verification tests would involve disturbance of up to 20 small 0.08-acre areas. Some of these areas may be in undisturbed habitats. No impacts are envisioned for biological resources given the small size of areas to be disturbed and the lack of threatened and endangered species in these areas. The final project, Hazardous Burn Tests, would involve digging four 9-m^2 (100-ft^2) pits, lining them with plastic, and burning defense-related material in the pits. These pits could be in undisturbed habitats. This project would also be performed in compliance with relevant environmental regulations and should have no impact on biological resources.

The Defense Program at the Tonopah Test Range involves a considerable amount of ground and air transportation. It is unlikely that this travel would significantly affect population viability of plants or animals, survival of individuals of threatened or endangered species, or springs and their associated habitats. No new infrastructure development is planned at the Tonopah Test Range for the Defense Program. Hazardous waste (5,614 kg [12,376 lb]) generated from these defense projects would be transported off site for disposal. No biological impacts are likely to occur from the transport of this hazardous material. No radioactive waste would be generated from Defense Program activities.

Environmental Restoration Program. This program would involve the removal and disposal of hazardous and radioactive materials from approximately 50 acres of undisturbed habitat, and the removal and disposal of ordnance scattered across approximately 1,000 acres. Cleanup would include characterization, remediation, and closure of sites. Disturbed sites would be revegetated as necessary. Disposal would involve transport of material to several sites both on and off the NTS.

Removal of ordnance would not result in long-term disturbance of habitat or the mortality of plants or animals. Removal of contaminants would have a beneficial, long-term impact on plant and animal populations found in or near contaminated sites. However, cleanup would also have a negative impact on habitat because areas must be completely or partially cleared of vegetation during this removal process. This impact would be less significant on previously disturbed sites because habitat in these areas was already disturbed before this project began.

This program would not negatively affect population viability because the disturbances are small relative to the geographic range of affected species. Candidate species, such as burrowing owls and some bats and economically or recreationally important species such as doves or waterfowl, might be exposed to drilling mud or surfactants in drill sumps constructed for monitoring wells. This could increase their chances of drowning. Transport of the removed material to approved disposal sites would not likely impact the biological resources because stringent safety protocols are followed.

Work for Others Program. The Work for Others Program activities under Alternative 1 are similar to activities associated with the Defense Program. The level of activity is expected to remain at current levels. Therefore, no impacts to biological resources are anticipated.

Site-Support Activities. No new infrastructure would be developed under Alternative 1. Therefore, no impacts to biological resources resulting from site-support activities are expected under this alternative.

5.1.2.7 Air Quality. The Tonopah Test Range is located in Nevada Intrastate Air Quality Control Region 147. Because there are no significant sources of pollutant emissions in the region, the air quality is good. The Air Quality Control Region is designated as unclassifiable/attainment for all criteria pollutants. Fugitive dust levels generated from construction activities were calculated. Other criteria pollutants were not considered because there are no active sources on the site. In addition, mobile source emissions were not calculated because of the minimal number of mobile sources.

Defense Program. Pollutant emissions would result from rocket artillery firing, as well as missile and explosives operations. These activities would be intermittent and produce only local emissions, which would be dispersed over the relatively large target area. Therefore, air quality impacts at the boundary and off site would be minor.

Environmental Restoration Program. About 80 acres would be disturbed during the Environmental Restoration Program activities. The average annual fugitive dust emission (PM_{10}) from Alternative 1 during Environmental Restoration Program activities would be about 2.4 tons. The total fugitive dust emissions generated from Environmental Restoration projects represents about less than 0.01 percent of the total fugitive dust (PM_{10}) generated in Nye County. Calculations assume that fugitive dust would be reduced by 50 percent as a result of watering the sites. Because activities would occur only on a short-term basis, long-term air quality impacts would not be expected.

Work for Others Program. At the Tonopah Test Range, the Work for Others Program would continue to include fuel air explosives operations. A fuel air explosive device can produce a detonation yield equivalent to several thousand pounds of high explosives. Fugitive dust, as well as gaseous pollutant emissions, would result from each explosives test. Local dust clouds would result, but they would be dispersed on site and would not produce high concentrations of dust off site. Therefore, air quality impacts would be minor.

5.1.2.8 Noise. Impacts to noise as a result of the Defense, Environmental Restoration, and Work for Others Programs are presented in this section. Site-support activities under Alternative 1 are not expected to generate significant noise on site or off site.

Defense Program. Heavy equipment operation during preparation and removal of equipment for mobile testing and construction of permanent testing facilities would result in noise levels of approximately 85 to 90 dBA near the equipment (15 m [50 ft]). The noise levels would decrease to 50 dBA at distances from 878 m to 1,524 m (2,800 ft to 5,000 ft). Periodic, short-term noise would occur as a result of artillery and explosives testing operations. However, the noise levels would decrease with distance. For example, a noise level of 90 dBA at 15 m (50 ft) decreases to 50 dBA at 2 km (1 mi) and to 44 dBA at 3 km (2 mi).

Environmental Restoration Program. Noise impacts would occur during site characterization (e.g., from drilling activities) and remediation (e.g., from large truck movement and heavy equipment operations). Temporary noise impacts from construction-related noise would occur within the immediate vicinity of construction sites. Because activities would only occur on a short-term basis, long-term noise impacts would not be expected.

Work for Others Program. During fuel air explosives operations, instantaneous noise levels at the Tonopah Test Range would be very high. However, these noise levels would be intermittent and would not produce significant impacts.

5.1.2.9 Visual Resources. Under Alternative 1, the only program anticipated to have impacts on visual resources is the Environmental Restoration Program. The other programs do not have ground disturbance associated with their activities.

Some new ground disturbance would occur as a result of Environmental Restoration Program activities, and some previously disturbed sites would also be redisturbed. Potential remediation disturbances area could range from 1 or 2 acres at the artillery site, to approximately 200 acres total for the contaminated soils sites. At some of the previously disturbed areas, vegetation has completely recovered, while others, such as landfills and lagoons, remain bare and debris-laden. Many areas of the contaminated soil sites have never suffered vegetation damage. Others are playa surfaces and are either sparsely vegetated or bare. One area of approximately 10,000 acres may have ordnance contamination and an estimated 10 percent of it would be disturbed by vehicle tracks during remediation. The remaining industrial sites are in developed areas.

The Clean Slates 1, 2, and 3 site areas of disturbance would depend upon the characterization

and agreed upon cleanup levels by the DOE and the state of Nevada. Resulting from 90 to 200 acres that would be disturbed, 40 acres of this area presently lie on the playa.

Summarizing, up to 200 acres comprised of increments of 1 or 2 acres up to 120 acres would be disturbed visually. Another area of approximately 10,000 acres would be altered by vehicle trailers through the vegetation. Three sites, each approximately 2 m x 2 m (6 ft x 6 ft), are associated with the Clean Slate 1, 2, and 3 tests. In addition to the Clean Slate sites, there are 43 other environmental restoration sites on the Tonopah Test Range that would disturb approximately 80 acres. The landscape character of the Tonopah Test Range is common to the region and is designated as Class C scenic quality. The affected areas would not be visible from public highways. Impacts to visual resources from Environmental Restoration Program activities would be negligible. There could be beneficial impacts to visual resources once revegetated areas have become established.

5.1.2.10 Cultural Resources. Impacts to cultural resources may occur as a result of ground disturbing activities associated with remediation, military testing, and the construction of utilities. Visitation and vehicular traffic may lead to vandalism or artifact collecting that could result in indirect impacts to cultural resources.

Defense Program. The exact nature and location of various Defense Program activities are not known at this time. These activities are expected to be conducted primarily in areas of previous operations and, thus, involve little or no surface disturbance. Another source of potential impact would be from unauthorized artifact collection by workers or visitors brought to the area by specific projects.

Environmental Restoration Program. This program has identified specific areas for characterization and potential remediation. The exact size and configurations will not be known until an agreement with the state of Nevada is reached regarding cleanup levels, and characterization has defined the boundaries involved. Some of these areas have been previously disturbed in conjunction with pre- and post-safety test activities. Previously disturbed areas will likely have little or no potential for archaeological information. Portions of some contaminated sites might present hazards to personnel that outweigh their archaeological information potential. Cultural resource surveys would not be conducted in previously disturbed areas where information potential has been destroyed and might not be implemented where personnel risk is judged as too high. If cultural resources exist in an area too highly contaminated to survey and conduct data recovery, then these resources may be lost when remediation disturbs the surface. The impact potential would likely be low because the known areas of high contamination are generally in areas of previous disturbance and are not associated with areas of high cultural resource potential.

Another potential source of impact would be from unauthorized artifact collection by workers or site visitors, although this is unlikely because site access to visitors and workers during remediation activities would be restricted.

Work for Others Program. Military research and development, such as small arms, artillery, gun, aircraft, and armored vehicle testing, and airdropped armaments, and development of associated electronic systems, might take place. If the activities occurred in an unanticipated area that had not been surveyed for cultural resources then there might be ground-disturbing impacts to cultural resources.

Site-Support Activities. Existing roadways might be used for transport, but, as part of the environmental restoration program, construction of a new road between the Tonopah Test Range and the NTS, crossing the NAFR Complex, has been proposed. Linear constructions, such as roadways that traverse large areas, would be likely to disturb the physical integrity of the cultural resources. A road would increase access and, consequently, the potential for unauthorized artifact collection. Cultural resources surveys would be performed prior to ground disturbing activities proposed under this program. Avoidance or data recovery would be implemented.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CTGO.

The CTGO knows that the actions considered in the NTS EIS potentially will affect American Indian cultural resources within an area roughly bounded by where these people live today in their traditional lands (Figure 4-47). The proposed NTS EIS actions will have cultural effects within this region of influence because of the cultural centrality of these lands to all three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiutes). Within this region of influence, specific actions will have direct local impacts. Ultimately, however, any action that moves the NTS away from or back towards its natural state has influence on all Indian people.

The CTGO recognizes that some of the actions proposed in the NTS EIS will have direct impacts on other Indian tribes and organizations. For example, the Project Shoal Area is located on the traditional lands of Northern Paiute people. The Eldorado Valley actions potentially impact the Mohave people. The return of radioactive waste to the NTS has permitted and potentially will permit people like the Alaskan natives to have their lands restored to a natural state (see Project Chariot Report [DOE/NV, 1994b]). Therefore, the CTGO defines the American Indian Region of Influence Map in an effort to focus on the cultural concerns of those people having traditional ties to the NTS, itself, but in so doing, does not intend to preclude the cultural concerns of other Indian ethnic groups.

Defense Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further aboveground nuclear tests occur and if natural lands are scraped for construction.

Waste Management Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative.

Environmental Restoration Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during Nondefense Research and Development Program actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Tonopah Test Range continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.1.2.11 Occupational and Public Health and Safety. The Defense, Environmental Restoration, and Work for Others Programs are the only programs expected to result in health and safety impacts to workers at the Tonopah Test Range. Occupational health and safety impacts may potentially result from industrial safety hazards in the workplace (e.g., injuries or fatalities from construction and maintenance), controlled exposure to radiation or hazardous chemicals in the workplace, and accidental exposures to radiation or hazardous chemicals. Impacts to worker health might take the form of injuries or fatalities from industrial hazards, and cancer fatalities or other detrimental health effects from exposure to radiation or hazardous chemicals. Table 5.1-16 summarizes the occupational and public health and safety

Table 5.1-16. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.5	0.0044	0.0025	0.001	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-9}	1×10^{-10}	9.6×10^{-7}
Environmental Restoration	0.0049	9.7×10^{-4}	2.4×10^{-4}	1.3×10^{-4}	e	e	1.2×10^{-9}	5.7×10^{-10}	e	e
Total	**2.5**	**0.0054**	**0.0027**	**0.0011**	**8.4×10^{-12}**	**1.8×10^{-5}**	**1×10^{-8}**	**4.7×10^{-9}**	**1×10^{-10}**	**9.6×10^{-7}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.

impacts for the applicable Tonopah Test Range program areas under Alternative 1.

The remote location of the Tonopah Test Range insulates impacts to the general public. To impact public health and safety, there must be a pathway or a transport mechanism to transmit the hazard to the public. None of the routine activities conducted at the Tonopah Test Range involves hazards that would impact public health and safety. Section 5.1.2.7, Air Quality, identifies no active sources for airborne release of radioactivity or criteria pollutants. Section 5.1.2.2.3 addresses impacts of transportation of radioactive materials and waste. Accidents associated with activities at the Tonopah Test Range could impact public health and safety and are discussed in this section.

Unless otherwise noted, impacts presented in this section are the total impacts for the 10-year period evaluated in this EIS. Results are presented for the applicable program areas, although some program areas do not involve hazards from radiation or hazardous chemicals.

Defense Program. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.5 injuries and 0.0044 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are projected as a result of routine program activities.

Based on previous occupational radiation periods, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 6-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0025 latent cancer fatalities and 0.0010 other detrimental health effects in the worker population. The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to worker risk of latent cancer fatality or other detrimental health effects.

The health and safety impact to the public from potential Defense Program accidents at Tonopah Test Range could result in about 9.0×10^{-9} latent cancer fatalities and 4.1×10^{-8} other detrimental health effects in the population. Additional risk due to accidental exposure to hazardous chemicals would be even less.

The maximum reasonably foreseeable Defense Program radiological accident at the Tonopah Test Range would be a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: Not applicable; involved workers are under cover when the device is fired
- Maximally exposed non-involved worker: 71 rem, 0.037 chance of latent cancer fatality, 0.023 chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 7,100 person-rem, 5.7 latent cancer fatalities, 2.3 other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 2.3 rem, 0.0012 chance of latent cancer fatality, 5.3×10^{-4} chance of other detrimental effects
- Population within 80 km (50 mi): 18 to 310 person-rem, 0.009 to 0.16 chance of a single latent cancer fatality, 0.004 to 0.071 chance of any other detrimental effects.

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident would be an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} (1 in 170,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion

- Maximally exposed non-involved worker: 1.4×10^{-8} chance of cancer, 0.30 noncancer hazard index for potentially life-threatening one-hour concentration

- Non-involved worker population at the nearest major facility area: 1.4×10^{-7} chance of a single cancer, 0.30 noncancer hazard index for potentially life-threatening one-hour concentration

- Maximally exposed off-site individual at the nearest point of public access: 4.1×10^{-7} chance of cancer, 1.0 noncancer hazard index for potentially life-threatening one-hour concentration

- Population within 80 km (50 mi): 1.7×10^{-6} to 1.1×10^{-7} chance of a single cancer, 0.016 to 0.03 noncancer hazard index for potentially life-threatening one-hour concentration.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, the Environmental Restoration Program is expected to result in 0.0049 injuries and 0.001 fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Tonopah Test Range Environmental Restoration Program workers of about 0.6-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 2.4×10^{-4} latent cancer fatalities and 9.6×10^{-5} other detrimental health effects in the worker population. The risk of accidental exposure to radioactive releases contributes nearly zero increase to worker risk of latent cancer fatality or other detrimental health effects. No Environmental Restoration Program hazardous chemical accident resulting in measurable effects at the Tonopah Test Range has been identified.

The health and safety impact to the public from potential Environmental Restoration Program accidents at Tonopah Test Range could result in about 1.2×10^{-9} latent cancer fatalities and 5.7×10^{-10} other detrimental health effects in the population.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the Tonopah Test Range would be an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash

- Maximally exposed non-involved worker: 0.012 rem, 4.8×10^{-6} chance of latent cancer fatality, 1.9×10^{-6} chance of other detrimental effects

- Non-involved worker population at the nearest major facility area: 1.2 person-rem, 4.8×10^{-4} chance of a single latent cancer fatality, 1.9×10^{-4} chance of any other detrimental effects

- Maximally exposed off-site individual at the nearest point of public access: 0.0034 rem, 1.7×10^{-6} chance of latent cancer fatality, 7.8×10^{-7} chance of other detrimental effects

- Population within 80 km (50 mi): 0.2 to 3.3 person-rem, 9.5×10^{-5} to 1.7×10^{-3} chance of a single latent cancer fatality, 4.4×10^{-5} to 7.6×10^{-4} chance of other detrimental effects.

Work for Others Program. The impacts would be the same as those described for the Defense Program.

5.1.2.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.1.1.12.

5.1.3 Project Shoal Area

The only program that will occur at the Project Shoal Area is the Environmental Restoration Program. Therefore, environmental restoration is the only program discussed for this site. Under Alternative 1, characterization and remediation activities at the Project Shoal Area would continue.

5.1.3.1 Land Use. Hazardous waste or other waste generated during environmental restoration actions would be disposed of off site at a permitted waste disposal facility. For the purposes of this evaluation, it has been assumed that radioactive waste would be disposed of at NTS facilities.

Some site characterization activities might have minor impacts on surrounding land use. There might be some impact on the use of restricted airspace or the use of the site by the U.S. Navy for strike rescue training. However, such impacts likely would be of short duration during active site characterization. The nearest population center is the community of Fallon, and it is not likely that any of the Alternative 1 actions would result in significant impacts on surrounding land use at the Project Shoal Area. Remediation activity would have the effect of negating any requirement restricting surface land uses near surface ground zero.

Under Alternative 1, continued site characterization and long-term hydrologic monitoring of the site could result in the disturbance of 10 acres of land. The Project Shoal Area, which is periodically used by the U.S. Navy for military maneuvers, consists of approximately 2,560 acres. The 10 acres identified for Environmental Restoration Program activities would represent less than 0.4 percent of the Project Shoal land area. Conflict between Environmental Restoration Program activities and other land uses would be temporary and negligible.

5.1.3.1.1 Site-Support Activities—Road traffic associated with Environmental Restoration Program actions would result in some short-term increases in road use. Water supplies for drilling and other activities would be trucked from off site, and short-term requirements for power would be met through generators.

5.1.3.1.2 Airspace—Under Alternative 1, the Environmental Restoration Program activities anticipated at the Project Shoal Area would not require direct air access other than for intermittent aerial radiological monitoring. Therefore, there would be minimal effects on airspace at the Project Shoal Area.

5.1.3.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.3.2.1 On-Site Traffic—Environmental Restoration Program activities would be short-term and would require relatively few personnel (less than 10 people at any given time). No public roads currently exist on the site. Minor vehicular traffic is anticipated; therefore, there would be no traffic impacts.

5.1.3.2.2 Off-Site Traffic—Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). In 1993, the average daily traffic on U.S. Highway 50 near the site amounted to 1,340 vehicles (NDOT, 1993); this traffic volume is far below the capacity of U.S. Highway 50 at this location (capacity ranges from 10,000 to 20,000 vehicles per day). Therefore, there would be no traffic impacts on off-site roadways.

5.1.3.2.3 Transportation of Materials and Waste—The highest risk resulting from environmental restoration activities would be in traffic fatalities and injuries. Both were calculated as less than one (person) being affected.

5.1.3.2.4 Other Transportation—Alternative 1 does not assume direct use of local railroads or other modes of transportation; therefore, direct effects on rail and other modes of transportation would be minimal. Furthermore, the anticipated

activities at the site do not call for a measurable transportation demand.

5.1.3.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.1.1.3.

5.1.3.4 Geology and Soils. Environmental restoration at the Project Shoal Area site would consist of locating and characterizing the mud pit by collecting shallow soil samples from the pit for chemical and radiological analysis, reentering wells that were drilled during the original activities on the site to convert them into groundwater monitoring wells, and monitoring the groundwater to detect any contaminant migration that might occur. Because these wells already exist and drill pads have been prepared, this work would not affect additional geologic media. The only preparation that is expected is clearing of the vegetation around the abandoned wells. The disturbed areas did not cause excessive erosion. They have revegetated naturally, so it is not expected that they would pose an erosional problem for the future.

No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Project Shoal Area from Alternative 1 activities. The site is not located on or near any known or exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features. The closest mine is an intermittently operated gold mine located approximately 8 km (5 mi) north of the site, but this is not close enough to be affected by any activities that have been or would be conducted on the site under this alternative.

5.1.3.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow. Discussions of impacts to water quality and water quantity are also presented.

5.1.3.5.1 Surface Hydrology—The impact of Environmental Restoration Program actions on the quality of surface water resources of the Project Shoal Area is not expected to be significant. Road building associated with well drilling might disturb small areas of soils. However, because of the very limited nature of surface water resources at the Project Shoal Area, the impact on surface water flows is expected to be minimal.

The soil-disturbing actions might result in slight increases in sediment yield and some inorganic compounds in the surface water. Given the limited amount of soil disturbance and the scant surface water resources, no significant adverse impacts on surface water quality are anticipated.

5.1.3.5.2 Groundwater—Planned groundwater use by the Environmental Restoration Program at the Project Shoal Area would be minimal and would be limited to that used in the drilling and testing of characterization wells, decontamination of sampling materials, and purging of wells prior to sampling. Annual water requirements for characterization have not been well defined, but are expected to be minimal. Because of the low demand for water, no significant impacts on water resource availability are anticipated. Similarly, because of the limited nature of Environmental Restoration Program activities, no significant adverse impacts on groundwater quality are anticipated.

5.1.3.6 Biological Resources. The only activities planned for this site consist of continued hydrological monitoring at existing wells. In addition, more wells might be drilled at this site, which may result in minor land disturbance. All 10 acres to be disturbed during environmental restoration have been disturbed previously; therefore, there are no likely biological impacts on habitat, population viability of plants or animals, threatened or endangered species, or regionally rare habitats (EG&G/EM, 1993).

5.1.3.7 Air Quality. The Project Shoal Area is located in Nevada Intrastate Air Quality Control Region 147. There are no air quality monitoring stations in the region. Because there are no significant sources of pollutant emissions in the region, the air quality is good. The Air Quality Control Region is designated as unclassifiable/attainment for all pollutants. The quantity of fugitive dust that could be generated

from the construction activities was calculated. Other criteria pollutants were not considered because there are no active sources on the site. In addition, mobile source emissions were not calculated because of the minimal number of mobile sources. Emissions from the operation of naval aircraft over the Project Shoal Area would have little impact on surface ambient pollutant concentrations. Studies have shown that resulting concentrations would be about 0.05 percent of the allowable concentration (SAIC/DRI, 1991).

Under the Environmental Restoration Program, about 10 acres of land would be disturbed. The average annual fugitive dust emission (PM_{10}) from Alternative 1 drilling activity would be about 3 tons. Calculations assume that fugitive dust would be reduced by 50 percent as a result of watering the sites. Calculations assume activities are only expected to occur on a short-term basis; therefore, long-term air-quality impacts are not expected.

5.1.3.8 ***Noise.*** Most of the noise at the Project Shoal Area would be generated during well drilling operations associated with the Environmental Restoration Program. All drilling operations occur on site, and there are no sensitive noise receptors. Noise impacts associated with increased traffic on access routes were not analyzed because the increase in traffic volume would be negligible.

Noise impacts would occur during site characterization (e.g., drilling) and remediation (e.g., large truck movement and front-end loaders). Temporary impacts resulting from construction-related noise would occur within the immediate vicinity of construction sites. Noise impacts from construction activities in the Project Shoal Area would be negligible because the closest private residence is 8 km (5 mi) west of the Project Shoal Area. Potential construction-related noise levels of 80 to 85 dBA at 15 m (50 ft) from the sources within the Project Shoal Area construction would be reduced to 30 dBA at 8 km (5 mi), which would be lower than ambient noise levels. Activities would only occur on a short-term basis; therefore, long-term noise impacts would not be expected.

5.1.3.9 ***Visual Resources.*** The scenic quality for the Project Shoal Area has been designated Class C, and the sensitivity level is low. The Project Shoal Area is approximately 2,560 acres; the affected area (10 acres) would represent less than 0.4 percent of the total area. Impacts from Environmental Restoration Program activities to visual resources would be negligible. Depending on pertinent reclamation factors, disturbed areas could be revegatated after cleanup has been completed. There would be some beneficial impacts to visual resources once revegated areas become established.

5.1.3.10 ***Cultural Resources.*** Ground-disturbing activities associated with remediation may effect the physical integrity of cultural resources. Indirect impacts to cultural resources might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES— This study area is not within the traditional lands of the Indian people represented by the CTGO. It is recommended by the CTGO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, and Pyramid Lake and Lovelock Paiute Tribes.

NOTE: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.1.3.11 ***Occupational and Public Health and Safety.*** The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Project Shoal Area. No contamination has been detected in surficial soils at this site, and no surface soil remedial actions are proposed. Activities at this site would consist of characterization and hydrologic monitoring. Impacts to worker health might take the form of injuries or fatalities from industrial hazards and cancer fatalities or other detrimental health effects from exposure to radiation or hazardous chemicals.

Table 5.1-17 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 1.

Table 5.1-17. Health risks to workers and the public from program activities, Project Shoal Area, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	9×10^{-6}	c	c	d	d	c	c
Total	**1.6×10^{-4}**	**3.1×10^{-5}**	**1.7×10^{-5}**	**9×10^{-6}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

Because of the remote location of the Project Shoal Area and the nature of planned Environmental Restoration Program activities, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents. Radioactive contamination is known to exist in the subsurface as a result of past underground nuclear weapons testing. Potential impacts to public health and safety from subsurface contamination of groundwater are discussed in this section.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Project Shoal Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Project Shoal Area Environmental Restoration Program workers of about 0.04 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area have been identified.

Subsurface radioactivity from past underground nuclear weapons testing at the Project Shoal Area could provide an exposure pathway for the general public. Transport modeling of tritium-contaminated groundwater at the Project Shoal Area was performed in support of this EIS (Chapman et al., 1995). The modeling results showed that peak tritium concentrations in groundwater could vary from nondetectable to about 20,000 pCi/L (depending on uncertainties in modeling parameters) at the nearest existing public wells. For comparison, EPA's maximum allowable tritium concentration in drinking water is 20,000 pCi/L. At the eastern boundary of the Project Shoal Area, where no well currently exists, peak tritium concentrations could be between 280 pCi/L, arriving 200 years after the test, and 720,000 pCi/L, arriving about 70 years after the test.

Health effects to the public from Project Shoal subsurface radioactivity estimated by Chapman et al. (1995) were based on future predictions of tritium concentrations in well water and on the assumption that a public well could be installed at the boundary of the Project Shoal Area. These impacts are not expected to occur within the 10-year timeframe evaluated in this EIS. The public exposure scenarios assume that a hypothetical individual would consume contaminated well water for 70 years centered around the time of peak tritium concentration in well water. At the eastern boundary of the Project Shoal Area, the maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 2×10^{-10} (about one in five billion) and 2×10^{-3} (about one in 500). At the nearest existing public well, a hypothetical maximally exposed individual is estimated to have a lifetime probability of contracting fatal cancer between 4×10^{-24} (essentially zero) and 2×10^{-7} (about one in five million).

5.1.3.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.1.1.12.

5.1.4 Central Nevada Test Area

The only program that would occur at the Central Nevada Test Area is the Environmental Restoration Program. Therefore, this program is the only one discussed for this site. Characterization and remediation activities at the Central Nevada Test Area would continue.

5.1.4.1 Land Use. Present use of the site is primarily for grazing, wildlife habitat, hunting, and scattered outdoor recreation. The DOE continues long-term monitoring and characterization and would complete needed remediation under this alternative. Sites that might require work include sewage lagoons, trash dumps, four emplacement holes, an uncovered hole, a runoff ditch, and drilling mud pits. Approximately 44 acres would be

disturbed by characterization and remediation at the three industrial sites. This would comprise less than 2 percent of the total site, which totals approximately 2,470 acres.

Wastes generated during Environmental Restoration Program activities would be disposed of at off-site permitted disposal facilities. For the purpose of this evaluation, it has been assumed that all radioactive wastes would be disposed of at NTS facilities. Closure in place would be an option evaluated for some sites.

Remediation would permit fewer to no restrictions on surface land uses. Closure in place would result in restricted surface use of the closure to protect the cap. The opportunity for a variety of land-use options would be improved under Alternative 1.

Surrounding land uses are similar to the site land uses with grazing, wildlife habitat, hunting, recreation, public land ranching, and widely scattered private ranch lands but there are no nearby population centers in the region. Environmental Restoration Program activities would have no effect on surrounding land uses.

5.1.4.1.1 Site-Support Activities—Road traffic associated with Environmental Restoration Program activities would result in some short-term increases in road use. Water supplies for drilling and other activities would be trucked from off site, and short-term requirements for power would be met through generators.

5.1.4.1.2 Airspace—There would be no effect on airspace at the Central Nevada Test Area as a result of Alternative 1 Environmental Restoration Program activities.

5.1.4.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.4.2.1 On-Site Traffic—The site is accessed by U.S. Highway 6, and there are no public access roads on site. Traffic generated by Environmental Restoration Program activities would be minimal and not significant.

5.1.4.2.2 Off-Site Traffic—Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day). Traffic volume is far below the capacity of U.S. Highway 6 at this location (capacity ranges from 10,000 to 20,000 vehicles per day). Therefore, under Alternative 1, there would be minor vehicular traffic generated. If remediation waste is removed from the site, then traffic on on-site roads would increase, but would be well within their capacity.

5.1.4.2.3 Transportation of Materials and Waste—The highest risk from Environmental Restoration Program activities would be in traffic fatalities and injuries. Both were calculated to be less than one person being affected.

5.1.4.2.4 Other Transportation—Alternative 1 activities do not include direct use of local railroads, air transportation, or other modes of transportation to this site; therefore, direct effects on rail, air, and other modes of transportation would be minimal.

5.1.4.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work; therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.1.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.1.4.4 Geology and Soils. Environmental Restoration Program activities at the Central Nevada Test Area would consist of characterizing the mud pits at each of the three emplacement holes and remediating them if needed, cleaning up the debris that has been left on the sites, and monitoring the groundwater to detect any contaminant migration that might occur.

No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Central Nevada Test Area from Alternative 1 activities. The site is not located on or near any known or exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features.

*5.1.4.5 **Hydrology.*** Environmental impacts to surface hydrology and groundwater are described in the sections that follow.

*5.1.4.5.1 **Surface Hydrology***—The impact of Environmental Restoration Program actions on the quantity of surface water resources of the Central Nevada Test Area is not expected to be significant. Road building associated with well drilling might disturb small areas of soils. However, because of the very limited nature of surface water resources at the Central Nevada Test Area, the impact on surface-water flows is expected to be minimal.

The soil-disturbing actions might result in slight increases in sediment yield and some inorganic compounds in the surface water. Given the limited amount of soil disturbance and the scant surface water resources, no significant adverse impacts on surface water quality are anticipated.

*5.1.4.5.2 **Groundwater***—Planned groundwater use by Environmental Restoration Program activities at the Central Nevada Test Area would be limited to that used in the drilling and testing of characterization wells, decontamination of sampling materials, and purging of wells prior to sampling. Annual water requirements for characterization are expected to be minimal. Because of the low demand for water, no significant impacts on water resources availability are anticipated. Similarly, because of the limited nature of Environmental Restoration Program activities, no significant adverse impacts on groundwater quality are anticipated.

*5.1.4.6 **Biological Resources.*** Remediation would likely include the removal of drill pond mud, sewage lagoons, and the transfer of hazardous materials to appropriate disposal sites. Transport of the removed material to approved disposal sites is not likely to impact biological resources because of the stringent safety protocols in place (Appendix I). About 44 acres would be disturbed by Environmental Restoration Program activities. Some of this land has been disturbed previously. Removal of contaminants would have a beneficial, long-term impact on plants and animal populations found on or near the contaminated sites. However, it would also have a negative impact on habitat because areas must be completely or partially cleared of vegetation during this removal process. This program would not negatively affect population viability. Disturbances do not occur where candidate plant species are likely to occur. Candidate species, such as State protected birds and some bats; and economically or recreationally important species, like doves or waterfowl, might be exposed to drilling mud or surfactant in drill sumps constructed for monitoring wells. This could increase their chances of drowning. No threatened or endangered species would likely be affected by these activities.

*5.1.4.7 **Air Quality.*** Ambient air quality has not been monitored for criteria pollutants at the Central Nevada Test Area. However, because the area lacks significant pollution emission sources, the air quality is good. The amount of fugitive dust generated from the construction activities was calculated. Other criteria pollutants were not considered because there are no active sources on the site. In addition, mobile source emissions were not calculated because of the minimal number of mobile sources.

A total of 44 acres of land would be disturbed at the Central Nevada Test Area during environmental restoration activities. The average annual fugitive dust emissions (PM_{10}) from Alternative 1 construction activities would be about 13.2 tons. Fugitive dust emissions assume a 50-percent reduction as a result of watering the construction sites. Air quality impacts would occur during site characterization and remediation (e.g., large truck movement and front-end loaders). Activities are only expected to occur on a short-term basis; therefore, long-term air quality impacts are not expected.

*5.1.4.8 **Noise.*** Noise impacts would occur during site characterization and remediation (e.g., large

truck movement and front-end loaders). Temporary impacts resulting from construction-related noise would occur within the immediate vicinity of the construction sites. Noise impacts from construction activities in the Central Nevada Test Area would be negligible because there are no sensitive receptors. Potential construction-related noise levels of 80 dBA to 85 dBA at 15 m (50 ft) from the sources within the Central Nevada Test Area construction would be reduced as the distance increases. Activities are only expected to occur on a short-term basis; therefore, long-term noise impacts are not expected.

5.1.4.9 Visual Resources. The scenic quality for the Central Nevada Test Area has been designated Class B, and the sensitivity level is low. The affected areas would be revegetated after cleanup has been completed. The Central Nevada Test Area is approximately 2,470 acres; the affected areas (44 acres) would represent less than 2 percent of the total area. Impacts to visual resources from Environmental Restoration Program activities would be negligible. Depending on pertinent reclamation facts, disturbed areas would be revegatated after cleanup has been completed. Beneficial impacts would occur when vegetation becomes established.

5.1.4.10 Cultural Resources. The exact location of all characterization and remediation activities is not known at this time. These activities are expected to be conducted largely in areas of previous operations and thus involve minor new surface disturbance. Other potential sources of impact would be from unauthorized artifact collection by workers or site visitors, although this is unlikely because of the tight control of visitors and workers at a remediation site.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CTGO.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Central Nevada Test Area. The following tribes were suggested: Fallon, Paiute, Walker River Paiute, and Pyramid Lake and Lovelock Paiute tribes.

Defense Program—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further nuclear tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program—Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 1, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are planned for this alternative, so American Indian cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are considered in this alternative, so American Indian cultural resources will not be adversely impacted.

5.1.4.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Central Nevada Test Area. Activities at this site would consist of site characterization and remediation with removal of contaminated mud and sludge. Impacts to worker health might take the form of injuries or fatalities from industrial hazards and cancer fatalities or other detrimental health effects from exposure to radiation or hazardous chemicals. Table 5.1-18 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 1.

Because of the remote location of the Central Nevada Test Area and the nature of planned Environmental Restoration Program activities, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents. Radioactive contamination is known to exist in the subsurface as a result of past underground nuclear weapons testing. Potential impacts to public health and safety from subsurface contamination of groundwater are discussed in this section.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Central Nevada Test Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Central Nevada Test Area environmental restoration workers of about 0.04-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Central Nevada Test Area have been identified.

Subsurface radioactivity from past underground nuclear weapons testing at the Central Nevada Test Area potentially provides an exposure pathway for the general public. Transport modeling of tritium-contaminated groundwater at the Central Nevada Test Area was performed in support of this EIS (Pohlmann et al., 1995). The modeling results show that tritium concentrations in groundwater are never expected to reach concentrations that are detectable (about 1 pCi/L) at any existing public wells. For comparison, the EPA's maximum allowable tritium concentration in drinking water is 20,000 pCi/L. At the southern boundary of the Central Nevada Test Area, where no wells currently exist, tritium concentrations are predicted to have reached a peak of 1.23×10^{8} pCi/L about 8 to 15 years after the test (between 1976 and 1983).

Health effects impacts to the public from the Central Nevada Test Area subsurface radioactivity have been estimated by Pohlmann et al. (1995) based on predictions of future tritium concentrations in well water and on the assumption that a public well could be installed at the southern boundary of the Central Nevada Test Area. The public exposure scenarios assume that a hypothetical individual would consume contaminated well water for 70 years centered around the time of peak tritium concentration in well water. At the existing public well nearest to the Central Nevada Test Area, the peak tritium concentration does not reach the well until about 117 years after the test date (about the year 2085). The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 1.7×10^{-24} (essentially zero) and 3.2×10^{-10} (about one in three billion). If a public well were to be drilled at a location near the southern boundary of the Central Nevada Test Area, with a peak tritium concentration of about 1.2×10^{8} pCi/L, Pohlmann et al. (1995) estimated that the maximally exposed public individual would have a lifetime probability of contracting a fatal cancer between 1.4×10^{-5} (about one in 70,000) and 5.5×10^{-3} (about one in 200). However, by the year 1996, radioactive decay would result in a 50-percent reduction of the peak

Table 5.1-18. Health risks to workers and the public from program activities, Central Nevada Test Area, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	9×10^{-6}	c	c	d	d	c	c
Total	**1.6×10^{-4}**	**3.1×10^{-5}**	**1.7×10^{-5}**	**9×10^{-6}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

concentration, and additional reduction would result from diffusion in the aquifer. Groundwater sampling and analysis results near the southern boundary of the Central Nevada Test Area have not confirmed these predicted tritium concentrations.

5.1.4.12 Environmental Justice. The Environmental Justice impacts for the region of influence are discussed in Section 5.1.1.12.

5.2 Alternative 2 - Discontinue Operations

Alternative 2, Discontinue Operations, is defined as the discontinuation of DOE/NV and interagency programs and operations at the NTS, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area. Only those environmental monitoring and security functions necessary for human health and security would be maintained. The DOE would maintain control of the NTS and the Tonopah Test Range, but no activities would take place. All facilities, after operations have ceased, would be placed in cold standby.

Defense Program. Defense Program operations would not be maintained in a state of readiness for nuclear testing, and there would be an overall discontinuation of DOE/NV defense-related activities at the NTS and the Tonopah Test Range.

Waste Management Program. The DOE would maintain only a minimum low-level and mixed waste disposal capability until NTS waste-generating activities completely shut down. After shutdown, on-site monitoring and security functions would be reduced and become part of the sitewide monitoring activity. Transuranic and transuranic mixed waste would be shipped to other DOE facilities for certification, handling, and disposal.

Environmental Restoration Program. All DOE/NV Environmental Restoration Program activities would cease.

Nondefense Research and Development Program. The DOE/NV would discontinue support of ongoing program operations.

Work for Others Program. The DOE/NV would not host projects and activities of other federal agencies. This would include a discontinuation of the use of the NTS airspace and certain lands by the DoD for various training exercises and defense-related research and development projects. However, the DOE would be required to provide for overflights and inspection of the NTS in accordance with international arms control treaties, such as the Open Skies Treaty.

5.2.1 Nevada Test Site

The impacts associated with the discontinuation of Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs are presented in this section. The impacts associated with site-support activities are also presented.

5.2.1.1 Land Use. Alternative 2 would result in no new ground disturbance. No activities would occur for the Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. Therefore, no impacts to land use would occur. No impacts to surrounding land use have been identified under this alternative.

5.2.1.1.1 Site-Support Activities—The site-support activities at the NTS would be almost entirely discontinued. Only minimal resources would be provided for those monitoring and security functions that would continue at the NTS. A minimal number of facilities would be maintained to support security and monitoring activities and personnel. Services would be effectively eliminated with the exception of minimal security services.

UTILITIES—Electrical, water, and wastewater systems under Alternative 2 would be limited primarily to Mercury. Mercury would be the central location for the security and monitoring personnel who would continue to perform duties at the NTS. The main 34.5-kilovolt (kV) powerline extending into the Yucca Flat area of the NTS would be maintained to provide power for monitoring equipment and services to the north.

The main components of power would remain largely as they exist under Alternative 1. Most of the 427 km (265 mi) of primary and secondary

power supply lines on the NTS would remain in place and would be used to power monitoring equipment, security stations, and a few administrative offices.

Most of the water supply lines would be abandoned and either left in place or removed and salvaged; however, water in this system must maintain a constant flow to prevent freezing in extreme temperatures. Water wells would be capped except for those that can be used for monitoring purposes. Water storage sumps and tanks would be drained and removed or filled in and graded over.

The NTS sewage-handling systems would be shut down and remediated. Sewage would be handled locally with septic tanks and leachfields. The number of personnel and the sewage generated in any single location would be too small to support the use of sewage lagoons as they currently exist.

COMMUNICATIONS—The telephone and radio portions of the communication system would be maintained to the extent necessary to support monitoring and security personnel on the NTS. The primary telephone communication link between Las Vegas and the NTS would remain. Radio communications would be the least affected on-site communication under this alternative. Radio communications would be required over much of the NTS to maintain contact capabilities for security personnel.

- Mobile radio communications would be reduced from around 30 nets to approximately 2 nets, and the digital microwave system would be reduced from 3 units to 1 unit. Central monitoring of NTS radio nets would be limited, but would be maintained at Station 900. The station would continue to function as an emergency reporting point for radio and telephone communications. The public safety network would be eliminated because of the lack of need for off-site DOE locations.

- Only minimal telephone communications would be maintained for communication to the Las Vegas area. Because the cost of maintenance would be so high, the functions provided by the DOE/NV central hub and switching network would be turned over to the local commercial telephone system. The Octel Maximum Voice Mail System would be eliminated.

- All video capabilities would be eliminated. Data communications capabilities would be removed except for the portion of the system that would be needed for monitoring purposes.

- There would be no NTS mail systems. The U.S. Post Office in Mercury would shut down.

5.2.1.1.2 Airspace—Under Alternative 2, the only activities that would affect airspace would be defense related; therefore, only Defense and Work for Others Programs are discussed. Occasional flights of helicopter and fixed-wing aircraft carrying supplies and personnel are anticipated, but these flights would not cause significant increases in air traffic.

Defense Program. The overall discontinuation of Defense Program activities would result in fewer traffic operations within NTS airspace relative to the baseline and a possible decrease of congestion in the overlapping airspace. Therefore, there would be no airspace or air traffic impacts from Defense Program activities.

Work for Others Program. With the Work for Others Program, there would be a discontinuation of the use of the NTS airspace by the DoD for various training exercises and defense-related research and development projects. No commercial air passenger, general aviation, or air-cargo activities would occur except for emergency operations or occasional aircraft operations carrying supplies and personnel.

Airspace restrictions under Alternative 2 would be the same as those currently in effect with the Nellis Air Traffic Control Facility. The overflights and inspections required for compliance with international arms control treaties that would be conducted under the Work for Others Program would not result in any airspace or air traffic impacts.

*5.2.1.2 **Transportation***. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

*5.2.1.2.1 **On-Site Traffic***—Under Alternative 2, access to the NTS would remain strictly controlled for security purposes, and minimal support would be provided to maintain access to those roads and to the infrastructure necessary to support decommissioning operations and long-term environmental monitoring efforts. Traffic generated within the NTS as a result of this alternative is estimated to be 60 trips per day.

Table 5.2-1 summarizes the average daily trip generation that would be attributed to each program. A minimal number of trips would be experienced on Mercury Highway. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to volumes assigned to each segment shows that no roadway would experience significant traffic congestion under Alternative 2.

Under Alternative 2, there would be no traffic generated on the roads within the NTS as a result of activities associated with Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. Under Alternative 2, traffic generated on the roads within the NTS as a result of work associated with site-support activities is estimated to be 60 average daily trips. The majority of these trips would be confined to Mercury Highway; however, approximately 10 percent would involve travel to Area 5. There would be no adverse effects on traffic flow as a result of site-support activities.

*5.2.1.2.2 **Off-Site Traffic***—Under Alternative 2, NTS employment on site would be reduced when compared to employment under Alternative 1. Correspondingly, a decrease in daily vehicle trips and traffic volumes on key roadway segments is anticipated, resulting in changes in the level of service. The decrease in vehicle trips during the peak hour was estimated for each roadway segment and subtracted from the baseline to obtain the future project traffic volumes on key roadways.

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. The major traffic generators at the site would be

Table 5.2-1. Average on-site daily trip generation (one-way trips) by program, under Alternative 2

Program	Trips per Day	Difference from Alternative 1
Defense	0	-635
Waste Management	0	-145
Environmental Restoration	0	-390
Nondefense Research and Development	0	-180
Work for Others	0	-190
Site-Support Activities	60	-1820
Total	**60**	**-3310**

from personnel involved with environmental monitoring, security functions, and maintenance of the associated facilities. Table 5.2-2 shows the changes in daily vehicle trips resulting from the loss of employees for each program activity for the years 1996, 2000, and 2005. These changes are all reductions relative to the baseline. After an initial reduction in employment in 1997, employment would remain constant. Under Alternative 2, the access highway to the NTS would experience the greatest reduction in vehicular traffic of an estimated 280 vehicles (in one direction) during the peak hour. Two roadway ramps on the Mercury interchange would experience a similar reduction of 235 vehicles. U.S. Highway 95 between the Mercury interchange and Las Vegas would experience a decrease of 235 vehicles. All other key roads would be likely to experience a reduction of less than 160 vehicles. The projected peak-hour traffic on key roads and the associated levels of service that would result under Alternative 2 for 1996, 2000, and 2005 are shown in Table 5.2-3.

Based on standards of the American Association of State Highway and Traffic Engineers, level of service B is appropriate for freeways and arterials and for rural highways in level or rolling terrain. Level of service C is appropriate for rural, mountainous, urban, and suburban areas. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990). By 2005, all key roads in the immediate vicinity of the site (U.S. Highway 95, the Mercury interchange ramps, and the access highway to the site State Route 433) would continue to operate at level of service C or better, an acceptable level according to the standards of the American Association of State Highway and Traffic Engineers. Under Alternative 2, it is likely that the current bus service to the NTS would be discontinued, resulting in a little less reduction in vehicular traffic than reported above. However, this scenario would not change any level of service on key roadways. Key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) currently operate at levels of service ranging from A to F; shortly after 2000, these key roads would all deteriorate to unacceptable level of service F.

These conditions would prevail without Alternative 2 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam already operates at an unacceptable level of service F, and its level of service would continue to deteriorate further, with

Table 5.2-2. Average off-site daily vehicle trip reduction from Alternative 1, under Alternative 2

Program	1996	2000	2005
Defense	-200	-330	-330
Waste Management	-30	-60	-60
Environmental Restoration	-50	-90	-90
Nondefense Research and Development	-30	-40	-40
Work for Others	-50	-80	-80
Site-Support Activities	-400	-840	-840
Total	**-760**	**-1440**	**-1440**

NOTE: All values are rounded to the nearest 10 and represent a net decrease relative to Alternative 1. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends.

Table 5.2-3. Peak-hour traffic and level of service on key roads, under Alternative 2[a]

Roadway Segments	Capacity VPH[b]	1996 DDHV[c]	1996 LOS[d]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 @ California/Nevada state line	6,800	2,968	E	3,726	F	4,687	F
I-15 north of Sahara Avenue interchange	10,200	7,234	F	8,851	F	10,968	F
I-15 north of the downtown expressway interchange	10,200	4,392	E	5,502	F	6,931	F
I-15 just north of the 'D' and Washington interchange	10,200	4,029	D	5,046	F	6,353	F
I-15 north of the Cheyenne interchange	6,800	1,864	C	2,618	D	3,602	F
I-15 south of the Lamb Blvd. interchange	6,800	627	A	805	A	1,056	A
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	630	A	875	A	1,188	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,750	C	1,995	C	2,309	C
I-80 east of West Wendover interchange (Nevada/Utah state line)	6,800	321	A	400	A	506	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	7,263	F	9,098	F	11,461	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,581	D	3,240	F	4,076	F
Rancho Road (SR 599) east of the northern U.S. 95/Rancho Road interchange	6,800	1,109	B	1,784	C	2,738	E
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	725	A	766	A	949	A
U.S. Hwy. 95 just east of Mercury interchange	6,800	234	A	150	A	184	A
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	18	B	10	B	10	B
Southbound on-ramp	1,300	118	B	10	B	10	B
Northbound off-ramp	1,300	118	B	10	B	10	B
Northbound on-ramp	1,300	18	B	10	B	10	B
SR 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,000	142	B	10	A	10	A
U.S. Hwy. 95 6.1 km (3.8 mi) north of Mercury interchange	2,000	270	C	300	C	350	C
U.S. Hwy. 95 @ Amargosa Valley to Beatty	2,000	56	A	57	A	66	A
U.S. Hwy. 95 north of Beatty	2,000	168	B	182	B	206	B
SR 160 south of U.S. 95	2,000	68	A	79	A	100	A
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	808	F	964	F	1,172	F
U.S. Hwy. 93 east of westbound off-ramp of Railroad Pass interchange	6,840	2,663	E	3,179	F	3,866	F
U.S. Hwy. 93 north of I-15/U.S. 93 interchange	2,000	121	B	145	B	188	B
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	127	B	148	B	182	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	41	A	44	A	54	A
SR 375 west of U.S. 93 junction at Crystal Springs	1,500	25	A	22	A	25	A
SR 375 east of Warm Springs	1,500	10	A	10	A	10	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	10	A	10	A	10	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	15	A	11	A	13	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	92	A	78	A	68	A

[a] Traffic volumes, reported as 10 vehicles, should be interpreted as very low volumes
[b] Vehicles per hour
[c] Directional design hourly volume (one direction)
[d] Level of service.

NOTE: SR = State Routes

or without this alternative, mainly because of its geometry (steep grades and narrow curves) and partially because of its moderate traffic volume and truck traffic. All other key roadways would generally continue to operate at level of service C or better.

The following sections address the contribution of environmental monitoring, security, and associated site-support activities to traffic impacts generated by the site and occurring at the access road off U.S. Highway 95.

Defense Program. Under Alternative 2, the loss in the number of employees associated with Defense Program activities would result in approximately 330 daily vehicle trip reductions with respect to Alternative 1 on a typical weekday in 2005. Except for site-support activities, defense-related activities would contribute the most to the reduction in the number of daily vehicle trips and peak-hour vehicles (approximately 23 percent of the total).

Waste Management Program. Under Alternative 2, the loss in the number of employees associated with Waste Management Program activities would result in approximately 60 daily vehicle trip reductions with respect to Alternative 1 on a typical weekday in 2005. The Waste Management Program activities would contribute to an approximate 4-percent reduction in the total number of daily vehicle trips.

Environmental Restoration Program. Under Alternative 2, the loss in the number of employees associated with the Environmental Restoration Program would result in approximately 90 daily vehicle trip reductions with respect to Alternative 1. The Environmental Restoration Program activities would contribute to an approximate 6-percent reduction in the total number of daily vehicle trips.

Nondefense Research and Development Program. Under Alternative 2, the loss in the number of employees associated with the Nondefense Research and Development Program activities would result in approximately 40 daily vehicle trip reductions with respect to Alternative 1. The Nondefense Research and Development activities would contribute slightly less than a 5-percent reduction in the total number of daily vehicle trips.

Work for Others Program. Under Alternative 2, the loss in the number of employees associated with Work for Others Program activities would result in approximately 80 daily vehicle trip reductions with respect to Alternative 1 on a typical weekday in 2005. These activities would contribute to a reduction in the number of daily vehicle trips of slightly less than 6 percent.

Site-Support Activities. Site-support activities are anticipated to cause a reduction of 840 vehicle trips in 2005. The reduction in trips is a result of fewer site-support employees who would be required with the discontinuation of site support activities at the NTS.

5.2.1.2.3 Transportation of Materials and Waste—The Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs would be eliminated, so no hazardous and/or radioactive shipments to the NTS would occur. Therefore, transportation risk under this alternative would decrease.

5.2.1.2.4 Other Transportation—No other modes of transportation would be used; therefore, no transportation impacts would be realized.

5.2.1.3 Socioeconomics. This section addresses the potential socioeconomic effects associated with Alternative 2. The description of socioeconomic conditions includes indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the site with Alternative 1. In addition, public finance and public services (public education, police and fire protection, and health) are described. The loss of employment and personal income and the increase in unemployment associated with Alternative 2 would result in substantial short-term adverse effects to the regional economy; however, economic and natural growth in the region of influence is expected to compensate for these reductions over time.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING. Under Alternative 2, it was assumed that an 86-person workforce would provide the necessary support to maintain minimum environmental monitoring and security functions. With the 86-person workforce, it is estimated that direct payroll and purchases of goods and services

would generate 164 secondary jobs (160 in Clark County and 4 in Nye County). Direct earnings are estimated at $4.2 million annually, and secondary earnings are estimated at more than $4.4 million annually. Of these earnings, $3.9 million in direct earnings and $4.3 million in secondary earnings would remain in Clark County; $0.3 million direct earnings and $0.1 million secondary earnings would remain in Nye County.

The major losses to the region of influence would include contractors and employees of the DOE, who are generally technicians and engineers, and the loss of other employment opportunities associated with the DOE. The region of influence would lose some diversification, thus increasing the influence and dependence on the service industry. The NTS is one of the major employers for technical positions that are usually filled by graduates of Nevada's universities and community colleges (State of Nevada Plan of Action for the Future of the NTS and its Work Force, 1994). In addition to the loss of employment diversification, the local universities would lose grants and other applicable funding. The loss of employment in Nye County would decrease per capita income from an average of $18,144 to $17,008, a decrease of 6.3 percent in 1998. However, economic activity and natural growth would compensate for this reduction.

Although it cannot be quantified, the region of influence and the state of Nevada would experience the loss of the Financial Assistance Award, an award that is negotiated every year between the state of Nevada and the DOE/NV. The Financial Assistance Award is provided to facilitate the accomplishment of activities in environmental safety and health oversight, monitoring, access, and emergency response initiatives to ensure compliance with applicable regulations. The award would be terminated within a year if this alternative were to be implemented. This impact has not been included in this analysis. The amounts change from year to year and cannot be accurately calculated.

Operational employment levels began to decline in 1987. Under Alternative 2, the decrease in employment is assumed to continue until all operations have been discontinued. It has been assumed that the first full year of closure would be 1997; Table 5.2-4 reflects the effects of this alternative to the economic indicators for Clark and Nye Counties. These are the total changes to the region of influence for all programs. Table 5.2-5 lists the housing projections for the region of influence. Figure 5.1-1 illustrates direct employment levels for all alternatives.

Defense Program. In the region of influence, in addition to the loss of 1,472 direct positions, an additional 2,802 secondary positions would be lost for a total of 4,274 jobs. In Clark County, the reduction in civilian employment (4,060 jobs) would contribute to the total increase in the unemployment rate from 5.8 percent under Alternative 1 to 9.0 percent under Alternative 2 in 1997. In Nye County, this decrease would result in a loss of 170 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in this program, it is expected that 1,700 persons would relocate from Clark County, contributing to a total decrease in population of 0.7 percent in 1998. In Nye County, 132 persons would relocate, contributing to the total 1.9 percent decrease in population in 1998.

After discontinuing operations, an estimated 664 households that support the Defense Program would relocate out of Clark County in 1998, contributing to the increase in the housing vacancy rate from an average of 7.9 percent to 8.5 percent in 1998. In Nye County, an estimated 49 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

Waste Management Program. In the region of influence, in addition to the loss of 250 direct positions, an additional 476 secondary positions would be lost for a total of 726 jobs. In Clark County, the reduction in civilian employment of 689 jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1996. In Nye County, this decrease would mean a loss of 29 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Table 5.2-4. Economic activity effects for Clark and Nye counties in 1996, 1997, 1998, 2000, and 2005 totals for all programs, under Alternative 2

Total Alternative 2	1996	1997	1998	2000	2005
Clark County					
Population	1,077,576	1,112,348	1,140,745	1,216,045	1,373,424
Total Jobs	498,230	506,017	522,923	558,389	632,514
Unemployment Rate	7.5	9.0	8.0	7.9	7.7
Personal Income ($Millions)	20,840.0	21,641.8	22,861.1	25,299.7	31,396.2
Nye County					
Population	27,407	28,918	29,928	33,383	37,933
Total Jobs	10,601	10,848	11,487	12,873	14,697
Unemployment Rate	8.6	11.3	8.4	8.0	7.7
Personal Income ($Millions)	57.1	471.3	509.0	592.3	736.1
Changes from Alternative 1 (Alternative 2 effects)					
Clark County					
Population	0	0	-7,496	-7,496	-7,496
Total Jobs	-9,308	-17,899	-17,899	-17,899	-17,899
Unemployment Rate	+ 1.7	+3.2	+ 2.2	+ 2.1	+1.9
Personal Income ($Millions)	- 467.1	-884.7	- 884.7	- 884.7	-884.7
Nye County					
Population	0	0	- 583	- 583	- 583
Total Jobs	- 389	- 748	- 748	- 748	- 748
Unemployment Rate	+ 3.4	+ 6.1	+ 3.2	+ 2.8	+ 2.5
Personal Income ($1,000)	- 23.6	- 44.6	- 44.6	- 44.6	- 44.6

Because of work stoppage in the Waste Management Program, it is expected that 289 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, 22 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 1,113 households that support the Waste Management Program would relocate out of Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent. In Nye County, an estimated eight households would relocate out of the area,

Table 5.2-5. Total housing projections for the region of influence, 1996, 1997, 1998, 2000, and 2005

	Alternative 1 Vacancy Rate (%)	Alternative 2, Housing Demand Decrease	Vacancy Rate (%)	Change in Vacancy Rate
Clark County				
1996	7.8	0	7.8	0.0
1997	7.9	0	7.9	0.0
1998	7.9	2,928	8.5	0.6
2000	7.9	2,928	8.4	0.5
2005	7.9	2,928	8.4	0.5
City of Las Vegas				
1996	7.1	0	7.1	0.0
1997	7.1	0	7.1	0.0
1998	7.1	1,029	7.7	0.6
2000	7.1	1,029	7.6	0.5
2005	7.1	1,029	7.6	0.5
City of North Las Vegas				
1996	5.9	0	5.9	0.0
1997	5.9	0	5.9	0.0
1998	5.9	171	6.4	0.5
2000	5.9	171	6.3	0.4
2005	5.9	171	6.3	0.4
Nye County				
1996	16.2	0	16.2	0.0
1997	16.2	0	16.2	0.0
1998	16.2	218	17.8	1.6
2000	16.2	218	17.5	1.4
2005	16.2	218	17.5	1.3
Town of Tonopah				
1996	17.6	0	17.6	0.0
1997	17.7	0	17.7	0.0
1998	17.9	24	19.2	1.3
2000	18.0	24	19.2	1.2
2005	18.0	24	19.3	1.3
Town of Pahrump				
1996	11.6	0	11.6	0.0
1997	11.6	0	11.6	0.0
1998	11.6	157	13.6	2.0
2000	11.6	157	13.3	1.7
2005	11.6	157	12.9	1.3
Amargosa Valley				
1996	17.8	0	17.8	0.0
1997	17.8	0	17.8	0.0
1998	17.8	8	19.4	1.6
2000	17.9	8	19.3	1.4
2005	17.8	8	19.0	1.2

which would cause the housing vacancy rate to increase in 1998 from an average 16.2 percent to 17.8 percent.

Environmental Restoration Program. In the region of influence, in addition to the loss of 389 direct positions, an additional 740 secondary positions would be lost for a total of 1,129 jobs. In Clark County, the reduction in 1,073 civilian jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would mean a loss of 45 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in this program, 449 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 35 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 175 households that support the Environmental Restoration Program would relocate out of Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5. In Nye County, an estimated 13 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

Nondefense Research and Development Program. In the region of influence, in addition to the loss of 191 direct positions, an additional 364 secondary positions would be lost for a total of 555 jobs. In Clark County, the reduction of 527 civilian jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would result in a loss of 22 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in this program, 221 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 17 persons would relocate, which would also contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 86 households that support the Nondefense Research and Development Program would relocate from Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent.

Work for Others Program. In the region of influence, in addition to the loss of 350 direct positions, an additional 666 secondary positions would be lost for a total of 1,016 jobs. In Clark County, the reduction in civilian employment of 965 jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would translate to a loss of 40 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in the Work for Others Program, 404 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 31 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 158 households that support this program would relocate from Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent. In Nye County, an estimated 12 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

Site-Support Activities. It is estimated that an 86-person workforce would perform these activities. In the region of influence, in addition to the loss of 3,838 direct positions, an additional 7,305 secondary positions would be lost for a total of 11,143 jobs. In Clark County, the reduction of 10,587 civilian jobs would contribute to the total

increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would result in a loss of 442 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage for site-support activities, 4,433 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 345 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 1,732 households that support this program would relocate out of Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent. In Nye County, an estimated 129 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

PUBLIC FINANCE. The fiscal effects of Alternative 2 are presented in this section. Table 5.2-6 outlines the projected financial summary for Fiscal Years 2000 and 2005 under Alternative 2. The fiscal impact of all alternatives can be determined by subtracting their income statement totals from the Alternative 1 future baseline. The remaining fiscal impact is the specific impact associated with each alternative.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed under Public Finance, Section 4.1.3.

Under Alternative 2, revenues for Clark County would increase because of increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures (see discussion on capital projects under Public Finance, Section 4.1.3), Alternative 2 would result in revenues less expenditures of a negative $5,916,000 in Fiscal Year 2000. It is expected that Clark County would achieve a positive fiscal position by Fiscal Year 2001. In Fiscal Year 2005, revenues less expenditures are expected to be $33,627,000. The fund balance (or reserves) as a percentage of current expense is expected to be 245 percent in 2000 and 374 percent in 2005. To compare with Alternative 1, Clark County revenues over expenditures would be $3,414,000 less in 2000 and in 2005.

City of Las Vegas. Under Alternative 2, revenues over expenditures for the City of Las Vegas are expected to become positive in Fiscal Year 1996 because of increases in population, personal income, and total employment in the city.

Assuming continued increases in revenues and expenditures, this alternative would result in revenues less expenditures of $12,928,000 in Fiscal Year 2000. It is predicted that the city would achieve an increasingly positive fiscal position and by Fiscal Year 2005, revenues over expenditures would be $14,984,000. The fund balance as a percentage of current expense is expected to be 177 percent in 2000 and 267 percent in 2005. To compare with Alternative 1, revenues over expenditures would be $1,452,000 less in 2000 and $1,451,000 less in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue to outpace revenues. Revenues over expenditures in Fiscal Year 2000 would be a negative $7,342,000 and a negative $6,845,000 in Fiscal Year 2005, despite small increases in population, personal income, and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to grow slowly to 1993 levels by Fiscal Year 2002. The fund balance as a percentage of current expense is expected to be 61 percent in Fiscal Year 2000 and 89 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $265,000 less in 2000 and 2005.

Table 5.2-6. Projected financial summary for Fiscal Years 2000 and 2005, general, special revenues, debt service, and capital projects funds, under Alternative 2

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($5,915,892)	$524,197,231	$1,284,861,518	245.11%
City of Las Vegas	$12,928,147	$196,311,179	$348,069,068	177.30%
City of North Las Vegas	($7,341,672)	$46,922,327	$28,626,284	61.01%
Clark County School District	($15,288,842)	$746,755,621	$123,507,085	16.54%
Nye County	$1,284,015	$25,646,743	$13,557,544	52.86%
Town of Tonopah	$73,867	$636,796	$804,554	126.34%
Town of Pahrump	$210,030	$934,496	$1,551,442	166.02%
Nye County School District	($1,529,444)	$26,240,727	($820,589)	-3.13%
Fiscal Year 2005				
Clark County	$33,627,168	$561,664,276	$2,102,270,259	374.29%
City of Las Vegas	$14,983,943	$210,173,311	$560,627,597	266.75%
City of North Las Vegas	($6,844,959)	$50,292,130	$44,991,457	89.46%
Clark County School District	($11,389,185)	$843,399,785	$188,657,527	22.37%
Nye County	$3,172,118	$27,663,424	$24,777,199	89.57%
Town of Tonopah	$71,158	$641,576	$1,165,212	181.62%
Town of Pahrump	$299,760	$1,083,655	$2,881,282	265.89%
Nye County School District	($262,911)	$29,814,400	$3,181,761	10.67%

Clark County School District. Under Alternative 2, revenues for Clark County School District would expand because of increases in population and corresponding school enrollment, although the level of increase would be less than that experienced under Alternative 1. Regular program and undistributed expenditures would likely continue to increase. The school district is not predicted to achieve a positive fiscal position by Fiscal Year 2005. In Fiscal Year 2000, revenues less expenditures would be a negative $15,289,000, and in Fiscal Year 2005, a less negative $11,389,000. The fund balance as a percentage of current expense is expected to be 17 percent in Fiscal Year 2000 and 22 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $222,000 more in 2000 and $221,000 more in 2005 because of the decreased expenses associated with smaller enrollments.

Nye County. Under Alternative 2, revenues for Nye County would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1999. This alternative would result in revenues less expenditures of $1,284,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,172,000. The fund balance as a percentage of current expense is expected to be 53 percent in Fiscal Year 2000 and 90 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $283,000 less in 2000 and 2005.

Town of Tonopah. Revenues and expenditures for the town of Tonopah would increase slightly because of small increases in population, personal income, and total employment in the county.

Assuming continued small increases, Alternative 2 would result in revenues less expenditures of $74,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $71,000. The fund balance as a percentage of current expense would be 126 percent in Fiscal Year 2000 and 182 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $5,000 less in 2000 and $4,000 less in 2005.

Town of Pahrump. Under Alternative 2, revenues for the town of Pahrump would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, this alternative would result in revenues less expenditures of $210,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $300,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 166 percent in Fiscal Year 2000 and 266 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $24,000 less in 2000 and $15,000 less in 2005.

Nye County School District. Under Alternative 2, revenues for Nye County School District would increase slightly because of small increases in population. Local sources would continue to generate the most revenue. Revenues less expenditures are expected to reach a negative $1,529,000 in Fiscal Year 2000 and negative $263,000 in Fiscal Year 2005. The fund balance as a percentage of current expense is expected to be a negative 3 percent in Fiscal Year 2000 and 11 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $127,000 more in 2000 and 2005.

PUBLIC SERVICES. Table 5.2-7 summarizes the levels of service that would be required under Alternative 2, and the text compares these levels to Alternative 1. In each case, the current levels of service per 1,000 population are assumed to continue.

Public Education. A total of 7,928 full-time equivalent licensed teachers were employed by the Clark County School District in the 1993-94 school year, resulting in a student-to-teacher ratio of 18.33. To continue with this ratio, the Clark County School District would require 11,044 teachers by the school year 2004 to 2005, or 61 less than under Alternative 1. The student-to-teacher ratio for Nye County School District was 16.39 in the school year 1994-95. Assuming this ratio were to be projected in the school year 2004 to 2005, 378 teachers or 6 less than under Alternative 1 would be required.

Police Protection. Assuming the same levels of service in the future, requirements for sworn police and deputy protection in the year 2005 can be examined. The Las Vegas Metropolitan Police Department would require 1,695 sworn police officers or 10 less than under Alternative 1. The North Las Vegas Police Department would require 181 sworn officers or 1 less. The Nye County Sheriff's Office in Tonopah would require 15 sheriff's deputies or no change in the number of sworn officers over Alternative 1. The town of Pahrump Sheriff's Substation would require 51, the Beatty Sheriff's Substation would require 5, and the Amargosa Valley Sheriff's Substation would require 3 or no changes over Alternative 1.

Fire Protection. The following is a discussion of firefighter personnel expected to be required in the year 2005 under Alternative 2. The Clark County Fire Department, which handles urban-area fires in the unincorporated county, would be expected to require 561 firefighters in 2005, or 3 less than under Alternative 1. Some 403 firefighters, or 3 less than under Alternative 1, would be required in the Las Vegas Fire Department in the year 2005. The North Las Vegas Fire Department would require 119 firefighters, or one less than under Alternative 1. The Tonopah, Pahrump, Beatty, and Amargosa Valley Volunteer Fire Departments would require 29, 54, 28, and 35 firefighters, respectively, which is 1 less than under Alternative 1 except for Beatty, which would remain the same.

Health Care. The 1995 levels of service for medical doctors and registered nurses was used to determine future needs based on population growth. In the year 2005, a total of 1,887 (or 10 less than under Alternative 1) medical doctors and 6,653 (36 less) registered nurses would be required in Clark County.

Table 5.2-7. Projected levels of public service for 1996, 2000, and 2005, under Alternative 2

Jurisdiction	Level of Service*	1996	2000	2005
Clark County School District Teachers	18.33	8,665	9,779	11,044
Nye County School District Teachers	16.39	273	333	378
Las Vegas Metropolitan Police Department (Las Vegas and county rural areas)	2.27	1,330	1,501	1,695
North Las Vegas Police Department	1.75	142	160	181
Nye County Sheriff's Office (Tonopah)	3.67	14	15	15
Pahrump Sheriff's Substation	1.85	30	40	51
Beatty Sheriff's Substation	2.59	5	6	5
Amargosa Valley Sheriff's Substation	2.01	2	3	3
Clark County Fire Department (urbanized unincorporated areas)	1.04	440	497	561
Las Vegas Fire Department	0.84	316	357	403
North Las Vegas Fire Department	1.15	93	105	119
Tonopah Volunteer Fire Department	7.09	27	29	29
Pahrump Volunteer Fire Department	1.98	32	43	54
Beatty Volunteer Fire Department and Ambulance Service	14.51	29	34	28
Amargosa Valley Volunteer Fire Department	23.12	26	31	35
Clark County Medical Doctors	1.37	1,481	1,671	1,887
Clark County Registered Nurses	4.84	5,220	5,891	6,653
Nye County Medical Doctors	0.34	9	11	13
Nye County Registered Nurses	1.53	42	51	58

* Level of service is per 1,000 population. The number of school teachers is based on student-to-teacher ratios, and the number of students is based on a percentage of the population.

In Nye County, 13 medical doctors and 58 registered nurses would be required, which is the same number of medical doctors and 1 less registered nurse than Alternative 1.

5.2.1.4 Geology and Soils. No adverse impacts to geology and soils would occur under Alternative 2 for Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs and for site-support activities. However, geologic media disturbed or contaminated by past activities would not be restored, and would continue to be monitored.

5.2.1.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the following sections. Discussions of impacts to water quality and water quantity are also presented.

5.2.1.5.1 Surface Hydrology—The surface hydrologic environment adversely impacted by past Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs would not be restored. Therefore, contaminated surface geologic media would continue to be a threat to any surface water present. The minimal site-support activities under Alternative 2 would not impact surface hydrology.

5.2.1.5.2 Groundwater—Under Alternative 2, the demand for water resources would be significantly decreased to levels required for environmental monitoring and potable water supplies for a caretaker workforce. Water quality might be adversely impacted because of the cessation of waste management and restoration activities that protect the groundwater quality. This, in turn, might limit the availability of water for other uses.

5.2.1.6 Biological Resources. Discontinuation of some site-support activities would lead to the shutdown of manmade water sources in several areas on the NTS. This, in turn, would likely influence the distribution of several wildlife species, including horses, deer, and chukar, and could result in loss of some local populations of these species.

A decrease in traffic on the NTS could result in fewer desert tortoises being accidentally killed on roads. However, because so few tortoises have been killed on NTS roads in the past (less than one per year), this decrease would have little positive effect on the tortoise population. At a sitewide level of analysis, there are no anticipated ecosystem-level impacts.

5.2.1.7 Air Quality. This alternative would not adversely affect air quality. Pollutant emissions associated with stationary sources would be essentially eliminated following closure, and mobile source emissions would be substantially reduced. There would be some level of air quality benefit associated with maintaining the site at a reduced level of activity compared with the levels of activity associated with the other alternatives.

Site-support activities could contribute a small portion to total emissions. Under Alternative 2, only environmental monitoring and security functions would be maintained. Stationary source emissions would be eliminated. Mobile source emissions would consist of exhaust emissions from workers' vehicles used to commute to and from the site. Assuming a worst-case scenario of about 100 vehicles traveling to the site, pollutant emissions would be as follows:

- Volatile organic compounds: 5.11 tons per year
- Carbon monoxide: 34.61 tons per year
- Nitrogen oxides: 7.60 tons per year.

These emission rates would be about 14 percent of the off-site mobile emission rates that would occur under Alternative 1. These emissions would be dispersed over a wide area and would not sufficiently increase ambient pollutant concentrations in Nye and Clark Counties to cause or increase violations of the Ambient Air Quality Standards. Thus, the ambient air quality designations in these counties would not change. The air quality impacts of this alternative would be small, but beneficial. A general conformity analysis would not be required (see Section 5.1.1.7).

RADIOLOGICAL AIR QUALITY. Under Alternative 2, effluents would be minimal because of resuspension of soils contaminated in the past. Impacts to the air quality would, therefore, be negligible.

5.2.1.8 Noise. Under this alternative, most noise sources, such as construction and material-handling equipment, boilers, pumps, engines, and wind tunnels, would be eliminated. A minor amount of noise would result from the operation of security and environmental monitoring vehicles on site.

Noise levels would become those typically found in uninhabited desert areas. The major sources of noise would be physical phenomena such as wind, rain, wildlife activities, and an occasional airplane (the wind is the predominant noise source.) Desert noise levels as a result of wind have been measured at an upper limit of 22 dBA for a still desert and 40 dBA for a windy desert.

With site-support activities, ambient noise levels of 30 to 35 dBA would probably be a reasonable estimate for the NTS. A minor amount of noise would result from vehicles used by workers commuting between NTS and Las Vegas on U.S. Highway 95. However, the noise levels generated by the worker's vehicles (about 100 vehicles) would not be detectable in the noise levels generated by the total traffic (buses, trucks, and automobiles) on U.S. Highway 95.

5.2.1.9 Visual Resources. Under Alternative 2, all facilities associated with each program would be abandoned in place. Only maintenance necessary for safety would occur. There could be a slow deterioration of facilities; however, there would be little change in the overall appearance of the existing landscape. Facilities would not be located in areas of high scenic value and would generally not be visible from any public viewpoints. Therefore, under Alternative 2, impacts to visual resources would be negligible.

5.2.1.10 Cultural Resources. Discontinuance of activities would eliminate many impacts to cultural resources. However, some ground-disturbing activities, such as landfill capping, and construction of fencing, may alter the physical integrity of

cultural resources. Some sites may be affected by vandalism and artifact collecting. Historic structures may be indirectly impacted by deterioration and neglect. Facilities would be evaluated for their potential to provide historical information, and appropriate consultation with the State Historic Preservation Office (SHPO) would be completed.

Waste Management Program. Direct impacts to cultural resources may result from capping of landfills and security fencing. Capping aggregate will be native soil which may be obtained from areas containing cultural resources. Indirect impacts such as unauthorized artifact collection may occur.

Environmental Restoration Program. Under Alternative 2, work on Environmental Restoration Program projects would be halted by 1996. Inactive sites would be abandoned. At some sites, decommissioning may involve activities designed to make facilities safe.

Nondefense Research and Development Program: Under this alternative there would be no Nondefense Research and Development Programs on the NTS.

Work for Others Program. This program is hosted by the DOE/NV and includes the shared use of certain NTS facilities and resources with other federal agencies such as the DoD. Activities include military training exercises and research and development projects such as weaponry tests. These kinds of activities would be discontinued under Alternative 2. Decommissioning activities might affect cultural resources.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

Defense Program at NTS—Under Alternative 2, there will be no further defense testing and storage activities. American Indian cultural resources will no longer be impacted by defense activities; American Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program at NTS—Under Alternative 2, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at NTS—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted by the monitoring well and access road program, but will be positively impacted by actions that return disturbed lands to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at NTS—Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted by visits of students and researchers.

Work for Others Program at NTS—Under Alternative 2, overflights and monitoring required in keeping with International Arms Control treaties have the potential for impacting American Indian cultural resources.

Defense Program at Area 13—Under Alternative 2, American Indian cultural resources will not be adversely impacted because there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program at Area 13—Under Alternative 2, American Indian cultural resources will not be adversely impacted because there are no waste facilities at the Area 13 site on the NAFR Complex.

Environmental Restoration Program at Area 13—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during

environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted by discontinuing research and development actions.

Work for Others Program at Area 13—Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted because no Work for Others Program actions are being planned.

5.2.1.11 Occupational and Public Health and Safety. Table 5.2-8 summarizes the occupational and public health and safety impacts for applicable program areas under Alternative 2. Site-support activities are estimated to result in a collective dose to workers that would not exceed about 6-person rem in 10 years. This dose could result in about 0.0025 latent cancer fatalities and 0.0010 other detrimental health effects in the worker population. Removal of transuranic and hazardous waste from the NTS under Alternative 2 was assumed to require some period of time to fully implement, and accidents could occur during the implementation period. The risk of accidental exposure to radioactive releases could result in a latent cancer fatality risk to workers of 0.016 and detrimental health effect risk of 0.0064. The risk of a single cancer in the worker population as a result of exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from accidents during implementation of Alternative 2 is estimated to be 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents during implementation of Alternative 2 could result in about 4.7×10^{-5} latent cancer fatalities and 2.1×10^{-5} other detrimental health effects in the population. The risk of a single cancer in the population due to accidental exposure to hazardous chemicals would be 2.0×10^{-5}. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be a multi-container fire at the Area 5 transuranic waste storage unit, which has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: plume rise from the fire carries the plume over close-in workers
- Maximally exposed non-involved worker: 3.7 rem, 0.0015 chance of latent cancer fatality, 5.9×10^{-4} chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 0.10 person-rem, 4.0×10^{-5} chance of a single latent cancer fatality, 1.6×10^{-5} chance of other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 0.0036 person-rem, 1.8×10^{-6} chance of latent cancer fatality, 8.3×10^{-7} chance of other detrimental effects
- Population within 80 km (50 mi): 1.5 to 26 person-rem, 7.5×10^{-4} to 0.013 chance of a single latent cancer fatality, 3.5×10^{-4} to 0.006 chance of other detrimental effects.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would be a multi-container fire at the Area 5 hazardous waste storage unit, which has a probability of occurrence of 8×10^{-4} (1 in 13,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: plume rise from the fire carries the plume over close-in workers

Table 5.2-8. Health risks to workers and the public from program activities, Nevada Test Site, Alternative 2

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Waste Management	h	h	0.016	0.0064	5.2×10^{-7}	0.48	4.7×10^{-5}	2.1×10^{-5}	2×10^{-5}	3.8×10^{-6}
Site-Support Activities	e	e	0.0025	0.001	f	f	g	g	f	f
Total	**0.0**	**0.0**	**0.019**	**0.0074**	**5.2×10^{-7}**	**0.48**	**4.7×10^{-5}**	**2.1×10^{-5}**	**2×10^{-5}**	**3.8×10^{-6}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No activities
f. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
g. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified
h. No routine operations anticipated, only shipment and disposal of current waste inventory.

- Maximally exposed non-involved worker: 8.8×10^{-3} chance of cancer, 51 noncancer hazard index for potentially life-threatening one-hour concentration

- Non-involved worker population at the nearest major facility area: 1.0×10^{-4} chance of a single cancer, 0.013 noncancer hazard index for potentially life-threatening one-hour concentration

- Maximally exposed off-site individual at the nearest point of public access: 1.2×10^{-6} chance of cancer, 0.0019 noncancer hazard index for potentially life-threatening one-hour concentration

- Population within 80 km (50 mi): 0.002 to 0.004 chance of a single cancer, 0.0019 noncancer hazard index for potentially life-threatening one-hour concentration.

Subsurface radioactivity from past underground nuclear weapons tests would continue to provide a potential exposure pathway for the public.

Potential health impacts from this exposure scenario are the same as those described in Section 5.1.1.11 under Alternative 1.

Perceptions of radiation effects are discussed in Section 4.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians perceptions of risk. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There has been recent workshop funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of restack, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and why we will continue to respond to future DOE activities.

5.2.1.12 Environmental Justice. Environmental Justice analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, then there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The CGTO has identified impacts to American Indian groups as a result of Alternative 2. While not physically located in Clark, Nye, or Lincoln counties, these groups have traditional ties to the NTS and surrounding areas. Impacts include continued reduced access to environmental restoration sites that would not be remediated. However, the degree of impact to American Indian cultural sites would be less than that associated with Alternative 1. These impacts would be perceived only by American Indian groups and would, therefore, be a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These concerns for all sites are discussed in Section 5.2.1.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety. These would only be felt by American Indian people. Therefore, a disproportionate impact would occur. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present, and future activities on the NTS have, are, or will impact these American Indian Environmental Justice issues. Although Alternative 2 involves no new activities, it contains the possibility of adversely impacting American Indian Justice issues. For example, if road maintenance is discontinued, it may be difficult for American Indian people to return to the area. Also if DOE/NV Environmental Protection personnel are not available, there may be a difficulty in maintaining consultation with American Indian tribes through the CGTO. Therefore, it is essential to maintain both the physical access to places and the agreement that facilitates access to these places. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program impacts are assessed in Section 5.1.1.12

5.2.2 Tonopah Test Range

This alternative is defined as the discontinuation of DOE/NV activities at the Tonopah Test Range. All U.S. Air Force and the DOE, Albuquerque activities would remain at planned mission levels and requirements. DOE/NV's discontinued programs include the Defense, Environmental Restoration, and Work for Others Programs. Therefore, only impacts resulting from the discontinuation of these programs are discussed for this site.

5.2.2.1 Land Use. Under Alternative 2, there would be no impacts on land use. Current restrictions governing access to areas of plutonium-contaminated soils would continue to be in effect. There would be no impact on surrounding land use as a result of the discontinuation of the DOE/NV Defense, Environmental Restoration, and Work for Others Program actions under Alternative 2.

Under Alternative 2, facilities would be secured, and overall monitoring at the Tonopah Test Range environmental restoration sites would take place. This could result in the closure of 1,616 km^2 (624 mi^2) of land at the Tonopah Test Range. Because activities are presently limited at the Tonopah Test Range, this would have a minor effect on users. To the extent that cessation of activities would reduce impacts on future land uses, this alternative would have a beneficial impact.

5.2.2.1.1 Site-Support Activities—DOE/NV site-support activities at the Tonopah Test Range under Alternative 2 would be discontinued. All site support activities associated with DOE, Albuquerque would continue. The impact from these activities would not exceed those impacts identified under Alternative 1.

FACILITIES - Facilities used by the DOE/NV would be closed and placed in cold standby. All facility support services performed by the DOE, Albuquerque would continue. Operational activities would be the same as those identified under Alternative 1. Joint-use infrastructure would remain the responsibility of the U.S. Air Force.

UTILITIES - Utilities would be maintained to ensure they are free of defects. Utilities not currently used would be shut down and stabilized to the extent possible so that they might be restarted and used at a later time. Water supply systems for DOE activities would remain operational to support DOE activities. The DOE wastewater flow to the sewage system would remain operational. The facultative lagoon would remain in operation and be maintained by the U.S. Air Force. Flows to remote location septic systems would cease as the facilities occupied by the DOE/NV are closed. All solid waste generated at the Tonopah Test Range would be contained in one solid waste disposal unit operated by the U.S. Air Force. This unit would not receive waste from the DOE/NV, but would continue to support all other operations at the Tonopah Test Range.

COMMUNICATIONS - The Tonopah Test Range has fully integrated communication systems of ground-to-ground and ground-to-air links using both radio frequency and land line equipment that ensures full support to test projects, administration, and emergencies. These site-support activities would remain open to support DOE, Albuquerque mission activities.

5.2.2.1.2 Airspace—The airspace over the Tonopah Test Range is Restricted Area R-4809. This airspace is managed by the DOE and is seldom authorized for joint use by civilian aircraft, with the exception of critical in-flight emergencies. Currently, limited flying operations occur over the range by the DOE and U.S. Air Force.

Defense Program. Under Alternative 2, the airspace would continue to be used by the U.S. Air Force and DOE, Albuquerque. Under this alternative, Defense Program activities would most likely be maintained at the current level of air traffic control and navigational aid service and airspace structure. Therefore, with the Defense Program, there would be no airspace or air traffic impacts.

Environmental Restoration Program. The discontinuation of Environmental Restoration Program activities would have no impact to airspace.

Work for Others Program. The Work for Others Program that is managed by DOE/NV and associated with defense-related programs would discontinue the use of the Tonopah Test Range airspace. Other DOE, Albuquerque Work for Others Program activities would continue at levels not to exceed those identified under Alternative 1. Airspace availability would continue to be coordinated between the U.S. Air Force and DOE, Albuquerque to ensure mission requirements are successful.

5.2.2.2 Transportation. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.2.2.1 On-Site Traffic—The on-site activities would not produce a significant level (or amount) of traffic demand. Therefore, the traffic congestion impacts on the on-site roadways would be minimal.

5.2.2.2.2 Off-Site Traffic—Under Alternative 2, DOE/NV activities at the Tonopah Test Range would be restricted to site monitoring and security, which would generate only an occasional and minor amount of vehicular traffic (less than 25 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). In 1993, the average daily traffic on U.S. Highway 6 near Tonopah amounted to 1,095 vehicles. This traffic volume would be far below the capacity of U.S. Highway 6 at this location (in the range of 10,000 to 20,000 vehicles per day). DOE, Albuquerque activities would not exceed levels discussed under Alternative 1. Therefore, there would be no traffic impacts on off-site roadways under Alternative 2.

5.2.2.2.3 Transportation of Materials and Waste—Transportation of materials and waste by DOE/NV from the Tonopah Test Range to authorized facilities, including the NTS, would not occur under Alternative 2. Transportation of materials and waste by the DOE, Albuquerque would be minimal and would not exceed those levels identified under Alternative 1; therefore, no impacts would result.

5.2.2.2.4 Other Transportation—The nature of anticipated activities on this site would not require a measurable transportation demand, direct use of local railroads, nor other modes of transportation. Therefore, direct or indirect effects on rail and other modes of transportation would be minimal.

5.2.2.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.2.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for

tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.2.2.4 Geology and Soils. Under Alternative 2, impacts to geologic media, processes, or resources would be the same as those described for the NTS in Section 5.2.1.4.

5.2.2.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the following sections.

5.2.2.5.1 Surface Hydrology—Under Alternative 2, impacts to surface hydrology would be the same as those described for the NTS in Section 5.2.1.5.

5.2.2.5.2 Groundwater—Under Alternative 2, the demand for water resources would remain at the same levels discussed for the NTS in Section 5.2.1.5. No significant adverse impacts to either groundwater supply or groundwater quality are anticipated.

5.2.2.6 Biological Resources. All scheduled activities would occur in previously disturbed areas. No habitat would be disturbed on the Tonopah Test Range under Alternative 2. The continued presence of radionuclides on 55 acres of land that would occur under this alternative should have no significant impact on biological resources unless those contaminants enter the regional groundwater.

Defense Program. No significant impacts on biological resources are anticipated.

Environmental Restoration Program. Under Alternative 2, contaminated sites on the Tonopah Test Range, including 55 acres contaminated with radionuclides, would be closed, without removal of contaminants. This might have a negative, but currently unquantifiable, impact on plant and animal populations living on or near that site that would be affected by those contaminants. However, it should not cause a decrease in the viability of populations. Those populations are widespread throughout the region, and the contaminants are limited to relatively small areas. The presence of contaminants in the environment should not affect threatened or endangered species or springs unless those contaminants enter the groundwater and are released at off-site springs.

Work for Others Program. No impacts to biological resources are anticipated as a result of Alternative 2.

Site-Support Activities. Under Alternative 2, the decrease in site-support activities would have no impact on biological resources.

5.2.2.7 Air Quality. Because none of the DOE/NV programs would occur at the Tonopah Test Range, no air quality impacts are expected. DOE, Albuquerque programs would continue at present levels; however, no significant air quality impacts would be expected.

5.2.2.8 Noise. Because none of the DOE/NV programs would occur at the Tonopah Test Range, no noise impacts are expected. DOE, Albuquerque programs would continue at levels not to exceed those identified under Alternative 1; no noise impacts are anticipated.

5.2.2.9 Visual Resources. Under Alternative 2, there would be little change in the overall appearance of the existing landscape. Therefore, impacts to visual resources would be negligible.

5.2.2.10 Cultural Resources. None of the DOE/NV programs would occur at the Tonopah Test Range; therefore, no impacts to cultural resources are anticipated.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

Defense Program—Under Alternative 2, there will be no belowground nuclear testing so American Indian cultural resources will not be adversely impacted.

Waste Management Program—Under Alternative 2, there will be no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative, so it is expected that

American Indian cultural resources will not be adversely impacted.

Environmental Restoration Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during nondefense research and development actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Tonopah Test Range continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.2.2.11 Occupational and Public Health and Safety. Under Alternative 2, Defense Program activities at the Tonopah Test Range would continue as under Alternative 1. Table 5.2-9 summarizes the health and safety impacts to workers and the public for applicable Tonopah Test Range program areas under Alternative 2. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.5 injuries and 0.0044 fatalities to workers during construction activities over the 10-year period evaluated in the NTS EIS. During the same period, no injuries or fatalities are projected as a result of routine program activities.

Based on previous occupational radiation periods, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 6 person-rem in 10-years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0025 latent cancer fatalities and 0.0010 other detrimental health effects in the worker population.

The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to worker risk of latent cancer fatality or other detrimental health effects.

The health and safety impact to the public from potential Defense Program accidents at Tonopah Test Range could result in about 9.0×10^{-4} latent cancer fatalities and 4.1×10^{-9} other detrimental health effects in the population. The risk of a single cancer in the population due to accidental exposure to hazardous chemicals is estimated to be 1.0×10^{-10}. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable radiological Defense Program accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} [(1 in 10,000,000)] per year).

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident also would be the same as described in Section 5.1.2.11 for Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} [1 in 170,000] per year).

5.2.2.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.2.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations.

Table 5.2-9. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 2

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.5	0.0044	0.0025	0.0010	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-9}	1×10^{-10}	9.6×10^{-7}
Total	**2.5**	**0.0044**	**0.0025**	**0.0010**	**8.4×10^{-12}**	**1.8×10^{-5}**	**9×10^{-9}**	**4.1×10^{-9}**	**1×10^{-10}**	**9.6×10^{-7}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more.

These impacts are discussed in Section 5.2.3.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present, and future activities on the Tonopah Test Range have, do, or will have a disproportionate impact on these American Indian Environment Justice issues. Although Alternative 2 involves no new activities, it contains the possibility of adversely impacting American Indian Environmental issues. If DOE/NV Environmental Protection personnel are not available, there may be a difficulty establishing future consultation with the American Indian tribes through the CGTO. Therefore, it is essential to establish both the physical access to places and agreements that will facilitate access to these places. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.2.3 Project Shoal Area

Under Alternative 2, all activities at the Project Shoal Area would be discontinued. The only program that is planned for the Project Shoal Area is the Environmental Restoration Program. Therefore, discontinuation of environmental restoration activities is the only program discussed for this site.

5.2.3.1 Land Use. Under Alternative 2, no significant impacts on surrounding land use as a result of Alternative 2 have been identified. The negligible existing baseline impacts of the DOE monitoring would continue under this alternative.

5.2.3.1.1 Site-Support Activities—No impacts as a result of site-support activities would occur under Alternative 2. Existing DOE monitoring activities would continue under this alternative.

5.2.3.1.2 Airspace—Under Alternative 2, the monitoring activities anticipated at the Project Shoal Area would not include direct use of air transportation. Therefore, there would be minimal effects on use of R-4812 airspace at the Project Shoal Area as a result of this alternative.

5.2.3.2 Transportation. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.3.2.1 On-Site Traffic—Monitoring activities would require relatively few personnel (less than 10 people at any given time). There are no public roads on site. Minor vehicular traffic is anticipated; therefore, there would be no traffic impacts.

5.2.3.2.2 Off-Site Traffic—Monitoring activities would generate an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). Therefore, no traffic impacts would occur on off-site roadways under Alternative 2.

5.2.3.2.3 Transportation of Materials and Waste—No transportation of materials and waste would occur under Alternative 2. Therefore, no impacts would result from transport of waste.

5.2.3.2.4 Other Transportation—Under Alternative 2, monitoring activities at the site would result in minimal direct effects on rail and other modes of air transportation.

5.2.3.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.2.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.2.3.4 Geology and Soils. No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Project Shoal Area if operations were discontinued. The site is not located on or near any known exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features.

5.2.3.5 Hydrology. Under Alternative 2, the demand for water resources would be significantly decreased to levels required for environmental monitoring. No significant adverse impacts, either to water supply or water quality, are anticipated.

5.2.3.6 Biological Resources. Under Alternative 2, no habitat would be disturbed, and no other activities would be conducted that might impact plants or animals.

5.2.3.7 Air Quality. Because none of the programs occur at the Project Shoal Area, no air quality impacts are expected.

5.2.3.8 Noise. Because none of the programs occur at the Project Shoal Area, no noise impacts are expected.

5.2.3.9 Visual Resources. Under Alternative 2, none of the programs occur at the Shoal Test Area. Therefore, impacts to visual resources would not be expected.

5.2.3.10 Cultural Resources. Because none of the programs occur at the Project Shoal Area, no impacts to Cultural Resources are expected.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

NOTE: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.2.3.11 Occupational and Public Health and Safety. Under Alternative 2, all operations at the Project Shoal Area would cease, except for security and environmental monitoring functions necessary for human health and safety, and security. No human health impacts are estimated for the major program areas because all projects and activities would be discontinued. Subsurface radioactivity from past underground nuclear weapons tests would continue to provide a potential exposure pathway for the public. Potential health impacts from this exposure scenario are the same as those described in Section 5.1.3.11 under Alternative 1.

5.2.3.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.2.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.2.3.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues from the Project Shoal Area site.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

5.2.4 Central Nevada Test Area

The only program that would occur at the Central Nevada Test Area would be the Environmental Restoration Program. Therefore, the discontinuation of environmental restoration activities for this site are the only impacts discussed. Under Alternative 2, all activities at the Central Nevada Test Area would be discontinued.

5.2.4.1 Land Use. Under Alternative 2, all actions planned for the Central Nevada Test Area would be discontinued. No significant impacts on surrounding land use as a result of Alternative 2 have been identified. The negligible existing baseline impacts of the DOE monitoring would continue under this alternative.

5.2.4.1.1 Site-Support Activities—No impacts as a result of site-support activities would occur under Alternative 2. The existing impacts of the DOE

monitoring activities would continue under this alternative.

5.2.4.1.2 Airspace—Fallon Naval Air Station intends to create military operating areas in three of Nye County's rural regions; they would be designated Smoky, Duckwater, and Diamond. The Central Nevada Test Area falls under the Duckwater military operating area. This airspace expansion has not yet been filed, but is not expected to impact monitoring activities at the Central Nevada Test Area. In addition, monitoring activities under Alternative 2 would not include direct use of air transportation. Therefore, there would be minimal effects on airspace at the Central Nevada Test Area as a result of Alternative 2.

5.2.4.2 Transportation. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.4.2.1 On-Site Traffic—Under Alternative 2, monitoring activities would require relatively few personnel (less than 10 at any given time). There are no public roads currently on site, and the low level of personnel anticipated would generate only a minor amount of traffic.

5.2.4.2.2 Off-Site Traffic—Under Alternative 2, environmental monitoring would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day). In 1993, U.S. Highway 6 near Warm Springs carried 145 to 210 vehicles average daily traffic. This traffic volume is far below the capacity of U.S. Highway 6 at this location (ranging from 10,000 to 20,000 vehicles per day). Therefore, there would be no adverse traffic impacts on off-site roadways under Alternative 2; thus, no mitigation measures would be required.

5.2.4.2.3 Transportation of Materials and Waste—No transportation of materials and waste would occur at the Central Nevada Test Area under Alternative 2. Therefore, no impacts would result from the transport of waste.

5.2.4.2.4 Other Transportation—Because Alternative 2 does not assume direct use of local railroads, air transportation, or other modes of transportation to this site, direct effects on rail, air, and other modes of transportation would be minimal.

5.2.4.3 Socioeconomics. The socioeconomic analysis is being prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.2.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.2.4.4 Geology and Soils. No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Central Nevada Test Area if operations were discontinued. The site is not located on or near any known exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features.

5.2.4.5 Hydrology. Under Alternative 2, the demand for water resources would be significantly decreased to levels required for environmental monitoring. No significant adverse impacts, either to water supply or water quality, are anticipated.

5.2.4.6 Biological Resources. Under Alternative 2, no impacts to plants or animals are anticipated.

5.2.4.7 Air Quality. Because none of the programs occur at the Central Nevada Test Area, no air quality impacts are expected.

5.2.4.8 Noise. Because none of the programs occur at the Central Nevada Test Area, no noise impacts are expected.

5.2.4.9 Visual Resources. Under Alternative 2, none of the programs occur at the Central Nevada Test Area. Therefore, impacts to visual resources would not be expected.

5.2.4.10 Cultural Resources. Under Alternative 2 none of the programs occur at the central Nevada Test Area. Therefore, no impacts to cultural resources are expected.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

Defense Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if further nuclear tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program—Under Alternative 2, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 2, it is expected that American Indian cultural resources at the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are planned for this alternative, so cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are considered in this alternative, so American Indian cultural resources will not be adversely impacted.

5.2.4.11 Occupational and Public Health and Safety. Under Alternative 2, all operations at the Central Nevada Test Area would cease except for security and environmental monitoring functions necessary for human health and safety and security. No human health impacts are estimated for the major program areas because all projects and activities would be discontinued. Subsurface radioactivity from past underground nuclear weapons test would continue to provide a potential exposure pathway for the public. Potential health impacts from this exposure scenario are the same as those described in Section 5.1.4.11 under Alternative 1.

5.2.4.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.2.1.12.

The American Indian responses regarding Environmental Justice are discussed in Section 4.1.12. American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.2.4.10, Cultural Resources, and 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present and future activities on the Central Nevada Test Area have, are, or will impact these American Indian Environmental Justice issues. Alternative 2 contains no new activities, it contains the possibility of adversely impacting these issues. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undue past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice Study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.3 Alternative 3 - Expanded Use

Alternative 3, Expanded Use of the NTS, is defined as the increased support of both defense and nondefense programs. This alternative includes support for the ongoing DOE/NV missions, as described under Alternative 1, with the addition of many new activities within each program. Alternative 3 includes programs at the NTS, portions of the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, and three Solar Enterprise Zone locations: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. The description of Alternative 1 activities is presented in Section 5.1. Therefore, this section summarizes only the additional activities that would be included under Alternative 3. A detailed description of the activities is presented in Appendix A.

Defense Program. Stockpile stewardship, stockpile management, nuclear emergency response, and storage and disposition of weapons-usable fissile material would be the four categories of activities included in the Defense Program under Alternative 3. Stockpile stewardship would consist of the same activities as under Alternative 1 with the addition of more complex hydrodynamic tests and dynamic experiments, advanced nuclear weapons simulators, the National Ignition Facility, and a new large, heavy industrial facility. Stockpile management would be made up of interim storage of nuclear weapons and construction of a stockpile management complex. Nuclear emergency response activities would be the same as those described under Alternative 1. The DOE would be responsible for the management, storage, and disposition of weapons-usable fissile materials from the nation's nuclear weapons dismantlement and weapons production processes.

Waste Management Program. As with Alternative 1, waste management activities at the NTS would continue to be conducted in four primary areas: Areas 3, 5, 6, and 11. The additional waste management activities that would be implemented under Alternative 3 for each area are described below.

The Area 3 Radioactive Waste Management Site activities would be increased to levels consistent with the centralized alternative in the Waste Management Draft Programmatic EIS. Three additional low-level waste disposal craters, one support building, and a truck decontamination facility would be constructed. All new waste disposal facilities will be designed and constructed to meet all applicable regulations. Closure of the additional disposal units would occur when they become full.

The radioactive and mixed waste disposal activities at the Area 5 Radioactive Waste Management Site would be increased to meet the need of additional DOE generators identified to ship waste to the NTS. Two additional low-level waste disposal pits would be opened (pending the approval of a modification to the Resource Conservation and Recovery Act Part B permit) and 20 mixed waste disposal cells would be prepared. Other construction would include a Class I sanitary landfill, a mixed waste storage unit, a low-level storage unit, a Waste Examination Facility, a real-time radiography building, a cotter concentrate treatment facility, and a new access building.

Waste management operations in Area 6 under Alternative 3 would be the same as those described under Alternative 1.

The Area 11 Explosive Ordnance Disposal Unit activities under Alternative 3 would be the same as those described under Alternative 1, except that treatment operations would be increased to a level near maximum capacity.

Environmental Restoration Program. Environmental Restoration Program activities would continue as described under Alternative 1, but would be accelerated. Expanded uses may require cleanup level adjustment in accordance with the applicable environmental requirements.

Nondefense Research and Development Program. Under Alternative 3, the changes in Nondefense Research and Development Program activities include the construction and operation of a Solar Enterprise Zone facility, increased activities

at the Spill Test Facility, and increased technology development activities.

Work for Others Program. Activities would be the same as those described under Alternative 1.

5.3.1 Nevada Test Site

The impacts that would occur at the NTS as a result of Alternative 3 are presented in this section.

5.3.1.1 Land Use. Alternative 3 would result in 5,809 acres of new ground disturbance resulting in a total of 64,500 acres compared to 58,729 acres of existing ground disturbance. Most of the new disturbance would be for new facility construction, especially a Solar Enterprise Zone facility (2,402 acres). The Defense Program would contribute 1,000 acres of new disturbance; the Waste Management Program, 209 acres; the Environmental Restoration Program, 51 acres; the Nondefense Research and Development Program, 4,582 acres; the Work for Others Program, 10 acres; and the site-support activities would contribute 30 acres.

Defense Program. Under Alternative 3, the High-Explosive Test Zone acreage would increase from 176 km^2 (68 mi^2) to 422 km^2 (163 mi^2) of land area. All 130 km2 (50 mi^2) of the former Critical Assembly Zone in Area 27 would become part of the Reserved Zone and would become available for diverse short-term testing and experimentation or short-duration exercises and training, such as those associated with Nuclear Emergency Search Team, Federal Radiological Monitoring and Assessment Center, and DoD land navigation. Alternative 3 also includes the creation of a 49-km^2 (19-mi^2) Defense Industrial Zone for stockpile management of weapons, including production; assembly; disassembly or modification; staging, repair, retrofit, and surveillance; and construction of a large, heavy industrial facility. Also included in this zone would be permanent facilities for stockpile stewardship operations involving equipment and activities such as radiography, lasers, special nuclear materials processing, and explosive-pulsed power.

In North Las Vegas the principal impact of the proposed National Ignition Facility project on land use at the North Las Vegas Facility would be the conversion of limited vacant land, which would not be available for other uses. The proposed National Ignition Facility would require about 8 acres, which represents approximately 10 percent of the total land area at the North Las Vegas Facility and 56 percent of land available for development at the North Las Vegas Facility. The impact of this conversion would be reduced somewhat by the existence of other areas on the site that would remain open for future development. Potential onsite impacts to land use could also result from required waste and water system upgrades, but the presence of the National Ignition Facility should not preclude future land uses for development in the city of North Las Vegas or Clark County.

Waste Management Program. Alternative 3 would not involve the expansion of the Radioactive Waste Management Zones in Areas 3 or 5. The land-use areas for solid waste landfills could be expanded to accommodate increased on-site municipal wastes and solid wastes from surrounding rural counties.

Environmental Restoration Program. Characterization and cleanup activities would be commensurate with the designated land uses at the site. Environmental restoration is not considered a land-use designation, but it is an activity required for characterization and re-use of lands and facilities.

Nondefense Research and Development Program. Under Alternative 3, the Nondefense Research and Development Program would designate approximately 62 km^2 (24 mi^2) of land area as a Solar Enterprise Zone. All other activities proposed for this program would be conducted in areas appropriately zoned for the activity.

Work for Others Program. Under Alternative 3, the Research Test Experiment Zone would be designated for defense-related small-scale research and development projects, demonstrations, pilot projects, and outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment under controlled

conditions. This zone area would increase from 36 km2[2] to 298 km^2 (14 mi^2 to 115 mi^2).

5.3.1.1.1 Site-Support Activities—Under Alternative 3, the NTS site-support activities would be modernized and expanded to the extent necessary to provide support for existing activities, as well as new projects and activities not previously conducted at the NTS.

FACILITIES—It is anticipated that the Control Point 1 and Mercury cafeterias would undergo minor renovation. In Area 23, Buildings 117 (offices) and 650 (the medical facilities and laboratory) would be expanded and renovated or modified. A new records management building would be constructed in Area 23, and the existing bulk fuel storage facility in Area 23 would be upgraded.

Current maintenance levels of existing off-site government-owned facilities would continue. The DOE and contractor personnel currently in leased facilities would relocate to the North Las Vegas facility. The North Las Vegas and Remote Sensing Laboratory Facility would be expanded to accommodate additional employees.

SERVICES—Law enforcement, security, fire protection, and health services would be expanded as required with this alternative.

UTILITIES—Power utilities at the NTS would be modified and expanded. The main electrical power substation on the line from Las Vegas would be replaced with a modern substation. A new switching center would be installed, and significant sections of the power grid would be upgraded. Water wells and supply lines would be installed, as necessary, depending on the location of future projects. Waste-handling systems would be built, as necessary, with environmental acceptability as a primary concern.

The NTS substation for the main 138-kV supply line from Las Vegas would be replaced with a modern substation. Along with this modernization, a new switching center and a switching station would be built. The existing 34.5-kV loop that extends primary supply into the forward areas of the NTS would be upgraded at the Area 2 substation. This upgrade would provide a backup feed line to the Rainier substation. There would be no significant increase to the approximately 427 km (265 mi) of primary and secondary power supply lines used on the NTS.

COMMUNICATIONS—Communications systems would be upgraded, mobile radio systems would be replaced with modern digital systems, and monitoring systems would be consolidated. Telephone communications would be enhanced with a modern microwave system and a paging terminal and controller. Fiber-optic links would be extended to facilities requiring extensive data communication capabilities.

The approximately 60 radio systems and 3,500 mobile units would be replaced with a digitally trunked mobile radio system. Administrative issues associated with the change, such as procedures and training, would be modified accordingly. Central monitoring of NTS radio nets maintained at Station 900 would be consolidated and enlarged to provide greater access for equipment and maintenance. This station would function primarily as an emergency reporting point for both radio and telephone. The public safety network, which provides coverage to most of Nevada and portions of nearby states, would be upgraded.

The central hub for telephone communications would be relocated to the Nevada Support Facility in North Las Vegas. The microwave portion of the system would be replaced with state-of-the-art microwave equipment, and the paging terminal and controller would be replaced to provide the highest level of flexibility. Additional Aspen voice mail systems would be added, as necessary, to the Octel maximum system that currently services the DOE/NV community.

The NTS would continue to operate the two existing mail systems. Little or no expansion is anticipated for either of the mail systems as a result of this alternative.

5.3.1.1.2 Airspace—Under Alternative 3, there could be an increase in flying time between

commercial airports within and outside Nevada. An increase in the number of operations is also projected. However, this alternative would most likely maintain the current level of air traffic control and navigational aid services, as well as the same airspace structure. Based on past trends and on improvements in communication, this alternative might cause modification and extended flight times for civilian aircraft.

The only activities that would affect airspace would be defense related. Therefore, only Defense and Work for Others Programs will be discussed and evaluated. However, occasional helicopters and fixed-wing aircraft carrying supplies and personnel are anticipated for all programs.

Defense Program. Under Alternative 3, there would be an increase in the support for ongoing defense-related activities located at the NTS, possibly resulting in the increase of air traffic operations. Assuming a 2-percent annual increase, operations would increase by approximately 20 percent over the 10-year study period. This would require additional coordination with other federal agencies to ensure all missions are accommodated.

Work for Others Program. Under Alternative 3, the Work for Others Program activities would cause an increase in the use of the NTS airspace by the DoD for training and defense-related research and development. No commercial air passenger, general aviation, or air cargo activities would occur within the NTS airspace. (Occasional DOE-related aircraft operations carrying supplies and personnel or for emergency operations might take place.) The continuation of operations at the NTS under the Work for Others Program within this alternative would require additional coordination with other military operations and activities to ensure both missions are accommodated.

5.3.1.2 ***Transportation.*** The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site traffic, off-site traffic, transportation of materials and waste, and other transportation.

5.3.1.2.1 On-Site Traffic—Traffic generated within the NTS as a result of land uses, projects, and activities associated with Alternative 3 is estimated to be 16,310 vehicle trips per day. Table 5.3-1 shows the average daily trip generation for each program. The daily trips were distributed on site based on existing travel patterns for commuters and the current NTS areas affected by each program.

Table 5.3-2 summarizes the average daily traffic volume for the key roadways on the NTS for Alternative 3. The portion of the average daily traffic volume that would be attributable to each program is also provided. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to the volumes assigned to each segment on Table 5.3-2 shows that no roadway would experience significant traffic congestion under Alternative 3.

Defense Program—Traffic generated on the roads within the NTS as a result of projects and activities associated with the Defense Program is estimated to be 2,450 average daily trips under Alternative 3. There would be no adverse effects on traffic flow as a result of the Defense Program.

Waste Management Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Waste Management Program is estimated to be 1,215 average daily trips under Alternative 3. The Radioactive Waste Management Sites in Areas 3 and 5 would continue operations as described in Alternative 1, with an increase in the scope of service to the entire DOE complex (DOE, 1995b). Projections indicate that the number of inbound shipments from off-site generators would be approximately 4,000 shipments per year, during the next 10 years, for an average of 20 shipments per day. The number of on-site generated waste shipments would remain at six shipments per day, as described under Alternative 1.

Road 5-01, the access to the Radioactive Waste Management Site in Area 5, is scheduled for improvement by the second quarter Fiscal Year 1997. The improvement project is described under Alternative 1 in Section 5.1.1.2.1. No adverse effects on traffic flow would occur as a result of the Waste Management Program.

Table 5.3-1. Average on-site daily trip generator (one-way trips) by program, Alternative 3

Program	Trips per Day On site	Difference from Alternative 1
Defense	2,450	+ 1,815
Waste Management	1,215	+ 1,070
Environmental Restoration	1,400	+ 1,010
Nondefense Research and Development	6,080	+ 5,900
Work for Others	1,130	+ 990
Site-Support Activities	4,035	+ 2,155
Total	**16,310**	**+12,940**

Environmental Restoration Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Environmental Restoration Program is estimated to be 1,400 average daily trips under Alternative 3. No adverse effects on traffic flow would occur as a result of the Environmental Restoration Program.

Nondefense Research and Development Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Nondefense Research and Development Program is estimated to be 6,080 average daily trips under Alternative 3. Traffic volumes on Jackass Flats Road, Cane Spring Road, and that portion of Mercury Highway that is south of Cane Spring Road would be approximately 3,000 vehicles per day for each segment, representing a substantial increase over Alternative 1. These volumes, however, represent on-site trips that were assumed to be uniformly distributed throughout the day. This, together with the fact that all on-site trips were also assumed to have an endpoint in Mercury, shows that no adverse effects on traffic flow would occur as a result of the Nondefense Research and Development Program.

Work for Others Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Work for Others Program is estimated to be 1,130 average daily trips under Alternative 3. No adverse effects on traffic flow would occur as a result of the Work for Others Program.

Site-Support Activities. Traffic generated on the roads within the NTS as a result of site-support activities is estimated to be 4,035 average daily trips under Alternative 3. No adverse effects on traffic flow would occur as a result of site-support activities.

5.3.1.2.2 Off-Site Traffic—Under Alternative 3, on-site NTS employment would be increased relative to the future baseline (Alternative 1). Correspondingly, an increase in daily vehicle trips and traffic volume on key roadways is anticipated.

This increase in vehicle trips was estimated for each roadway segment and added to the baseline to obtain the overall vehicle trips for the project.

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. The major traffic generators at the site resulting from various programs under Alternative 3 are the additional construction and operation employees (totaling 389 employees in 1996; 3,011 employees in 2000; and 2,051 employees in 2005) and their associated activities. Note that the employment figures represent the increment above the baseline

Table 5.3-2. Average daily traffic volumes on key NTS roadway segments under Alternative 3

Roadway	Segment	Average Daily Traffic Volume						
		Defense	Waste Management	Environmental Restoration	Nondefense Research and Development	Work for Others	Site Support	Total
North								
Buckboard Mesa Rd.	Pahute Mesa Rd. to Airport Rd.	245	0	110	0	0	0	**355**
Mercury Hwy.	Tippipah Hwy. to Ranier Mesa Rd.	490	245	325	0	0	0	**1,060**
Pahute Mesa Rd.	Mercury Hwy. to Stockade Wash Rd.	490	0	215	0	0	0	**705**
Pahute Mesa Rd.	Stockade Wash Rd. to Buckboard Mesa Rd.	245	0	110	0	0	0	**355**
Ranier Mesa Rd.	Mercury Hwy. to Tippipah Hwy.	490	0	110	0	0	0	**600**
Tippipah Hwy.	Mercury Hwy. to Pahute Mesa Rd.	980	0	430	0	0	0	**1,410**
Tippipah Hwy.	Pahute Mesa Rd. to Ranier Mesa Rd.	0	0	110	0	0	0	**110**
South								
Cane Spring Rd.	Lathrop Wells Rd. to Mercury Hwy.	0	0	110	3,000	520	0	**3,630**
Jackass Flats Rd.	Mercury Hwy. to Lathrop Wells Rd.	0	0	325	3,040	565	0	**3,930**
Lathrop Wells Rd.	U.S. Highway 95 to Jackass Flats Rd.	0	0	110	40	45	0	**195**
Mercury Hwy.	Mercury Hwy. to Road 5-01	1,960	1,215	970	3,000	520	405	**8,070**
Mercury Hwy.	Road 5-01 to Cane Spring Rd.	1,960	305	860	3,000	520	405	**7,050**
Mercury Hwy.	Cane Spring Rd. to Tippipah Hwy.	1,960	305	860	0	0	405	**3,530**
Road 5-01	Mercury Hwy. to Area 5 RWMS	0	790	110	0	0	0	**900**
Road 5-07	Mercury Hwy. to Area 5 RWMS	0	120	0	0	0	0	**120**

NOTE: RWMS= Radioactive Waste Management Site.

figures (Alternative 1). Table 5.3-3 shows a summary of average daily vehicle trips increase by each program activity for the years 1996, 2000, and 2005. The year 2000 represents a peak in the increased number of trips.

Under Alternative 3, the NTS access road (State Route 433) would experience the greatest increase in traffic during the peak hour (in one direction). This increase would be 40 vehicles in 1996, 300 in 2000, and 200 in 2005. Similarly, 30 vehicles would be added in 1996 to the Mercury interchange ramps serving Las Vegas, 250 vehicles in 2000, and 135 in 2005. Approximately 100 to 250 vehicles would be added to U.S. Highway 95 between Mercury and Las Vegas in 2000. Most other roadway segments would generally experience less than 100 additional vehicles during the peak hour. This figure would be less by 20 for segments in remote areas. The projected peak-hour traffic on key roads and the associated level of service that would result under Alternative 3 for 1996, 2000, and 2005 are shown in Table 5.3-4.

Based on Association of American State Highway and Transportation Officials standards, level of service B is appropriate for freeways; arterials; and rural, level, or rolling terrain. Level of service C is appropriate for rural (mountainous), urban, and suburban highways. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990).

Under Alternative 3, the access highway to the site (State Route 433) would operate at level of service C in 1996 and level of service D in 2000 and 2005. According to Association of American State Highway and Transportation Officials standards and considering this access to be a local highway, level of service D is acceptable. Roadway ramps at the Mercury interchange would continue to operate at level of service B. U.S. Highway 95 east of Mercury would continue to have excess capacity and would operate at level of service A. However, U.S. Highway 95 north of the Mercury interchange would likely operate at level of service D by 2005.

On the other hand, key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) already operate at levels of service ranging from A to F, and by 2000, they would all deteriorate to unacceptable level of service F. These conditions would prevail even without Alternative 3 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam (rural and mountainous) already operates at unacceptable level of service F, and its level of service would continue to deteriorate further with or without this alternative, owing to its geometry (steep grades and narrow curves) and partially to its moderate traffic volume and truck traffic. All other key roadways would continue to operate at level of service C or better. These conditions would prevail with or without Alternative 3 and with or without any single program activity. The following sections address the contribution of each program activity to traffic impacts. The trips discussed for each program account for construction and operations activities generated by the site and occurring at the access road off U.S. Highway 95.

Defense Program. With the Defense Program, 40 additional daily vehicle trips in 1996, 350 in 2000, and 350 in 2005 would be generated. Except for site support, the defense-related activities would have the highest number of daily vehicle trips, peak-hour vehicles, and the most traffic impacts. The defense activities would contribute 34 percent to total trips added under Alternative 3 in 2005.

Waste Management Program. Under Alternative 3, the Waste Management Program would add 130 vehicle trips on a typical weekday in 2005. The number of daily vehicle trips added would amount to less than 13 percent of trips added by all programs.

Environmental Restoration Program. Under Alternative 3, Environmental Restoration Program activities are expected to be accelerated relative to Alternative 1. The largest number of trips added is expected to be approximately 90, or 9 percent of the total in 2005.

Nondefense Research and Development Program. Under Alternative 3, approximately 40 vehicle trips would be added with this program on a typical weekday. In 2005, the Nondefense activities would contribute less than 4 percent to the total number of daily vehicle trips.

Table 5.3-3. Average daily vehicle trip increase off site under Alternative 3

Program	1996	2000	2005
Defense	40	350	350
Waste Management	20	130	130
Environmental Restoration	30	90	90
Nondefense Research and Development	10	40	40
Work for Others	10	10	10
Site-Support Activities	100	900	410
Total (all programs)	**210**	**1,520**	**1,030**

NOTE: All values are rounded to the nearest 10. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends. Trips shown are the increase from Alternative 1.

Table 5.3-4. Peak-hour traffic volumes and level of service on key off-site roads under Alternative 3 (Page 1 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 at California/Nevada state line	6,800	2,984	E	3,774	F	4,724	F
I-15 north of Sahara Avenue interchange	10,200	7,343	F	9,188	F	11,226	F
I-15 north of the Downtown Expressway interchange	10,200	4,439	E	5,647	F	7,042	F
I-15 just north of the 'D' and Washington interchange	10,200	4,076	D	5,190	F	6,468	F
I-15 north of the Cheyenne interchange	6,800	1,911	C	2,763	D	3,712	F
I-15 south of the Lamb Blvd. interchange	6,800	658	A	901	A	1,129	B
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	637	A	899	A	1,207	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,758	C	2,019	C	2,327	C
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	329	A	424	A	524	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	7,341	F	9,339	F	12,645	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,597	D	3,288	F	4,113	F
Rancho Road (SR 599) east of the northern U.S. Hwy. 95/Rancho Road interchange	6,800	1,234	B	2,169	D	3,033	E
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	873	A	1,224	B	1,300	B
U.S. Hwy. 95 just east of Mercury interchange	6,800	390	A	633	A	553	A
U.S. Hwy. 95 just south of Boulder City	2,220	599	C	633	C	680	C
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	42	B	75	B	57	B
Southbound on-ramp	1,300	274	B	489	B	409	B
Northbound off-ramp	1,300	274	B	489	B	409	B
Northbound on-ramp	1,300	42	B	75	B	37	B
SR 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,200	329	C	588	D	291	D

Table 5.3-4. Peak-hour traffic volumes and level of service on key off-site roads under Alternative 3 (Page 2 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
U.S. Hwy. 95, 6.1 km (3.8 mi) north of Mercury interchange	2,200	286	C	348	C	390	D
U.S. Hwy. 95 at Amargosa Valley to Beatty	2,000	64	A	82	A	86	A
U.S. Hwy. 95 north of Beatty	2,000	176	B	206	B	226	C
SR160 south of U.S. Hwy. 95	2,000	75	A	103	B	120	B
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	824	F	1,012	F	1,209	F
U.S. Hwy. 93 east of Westbound off-ramp of Railroad Pass interchange	6,840	2,710	E	3,324	F	3,976	F
U.S. Hwy. 93 north of I-15/U.S. Hwy. 93 interchange	2,000	137	B	193	B	225	C
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	134	B	172	B	200	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	49	A	68	A	72	A
SR 375 west of U.S. Hwy. 93 junction at Crystal Springs	1,500	33	A	46	A	43	A
SR 375 east of Warm Springs	1,500	15	A	27	A	23	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	17	A	29	A	25	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	23	A	35	A	32	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	100	B	103	B	86	A

[a] Vehicles per hour
[b] Directional design hourly volume (one direction)
[c] Level of service
Note: SR = State Route.

Work for Others Program. Under Alternative 3, employees of the Work for Others Program would add 10 vehicle trips per day.

Site-Support Activities. Site-support activities are expected to add 900 additional vehicle trips in 2000 and 410 in 2005. These trips account for operations activities related to roads, utilities, communications, and other site support. Under Alternative 3, these activities would contribute to approximately 60 percent of the total number of increased daily trips in 2000.

5.3.1.2.3 Transportation of Materials and Waste—Alternative 3 represents a significant increase in the mission of the NTS. The majority of the activities under this alternative are associated with Defense and Waste Management Program activities.

Activities identified for the Defense Program include added responsibilities for the stockpile stewardship mission. Besides the NTS's primary mission of readiness to test nuclear weapons other activities include relocation of assembly/disassembly activities and management of special nuclear materials (plutonium pits) and other highly explosive materials. The transportation of nuclear explosive materials are required for the following reasons for this alternative:

- Weapons currently stored at classified DoD facilities are returned to the NTS for dismantlement.
- Weapons are returned to the identified assembly area for testing, modification upgrades, and certain component replacement.
- Weapons are returned to DoD facilities upon completion of modification or test of the unit.
- Weapons are shipped between the DOE and DoD facilities for field testing of subsystems.

Under Alternative 3, the Waste Management Program activities also increase based on the DOE mission. The projected generators, waste types, volumes, and shipments are given in Tables 5.3-5 and 5.3-6. Table 5.3.-5 reflects a 10-year average estimate of LLW volumes and shipments by generator sites for Alternative 3. The yearly average for LLW, ignoring NTS generated LLW, is approximately 2,460 shipments/year. The estimates were derived from current waste storage volumes provided by Waste management Draft Programmatic EIS and the projected generated rate for the next 10 years. These volumes and sources are based on the best available information and volumes may change based on the final Waste Management Programmatic EIS or updated waste load inventories or projections from the respective sites. Table 5.3-6 reflects a ten-year average estimate of MW volumes and shipments by generator sites for Alternative 3. The yearly average for MW, ignoring NTS generated MW, is approximately 1,540 shipments/year. Specific detail about DOE-related transportation activities, including associated risk and routes, is provided in Appendix I.

Defense Program. For this EIS, it was assumed that there would be a maximum number of special nuclear material and other high-explosive materials shipments of 2,100 to the NTS. This includes approximately 140 test devices shipments, 1,590 nuclear and high explosives, and 360 plutonium pit shipments. These activities support projected activities associated with underground nuclear testing, assembly/disassembly activities and storage of special nuclear material, and other associated high explosives. On site at the NTS the only hazard would be from the 32 to 40 km (20 to 25 mi) of roadway that the safe-secure trailer would travel; a group of flammable-liquid storage tanks, protected by dikes, is located near Mercury, about 31 m (100 ft) off the roadway.

The health risk estimates from the transportation of Defense Program special nuclear materials were calculated using the model, ADROIT. This model calculates the risk from both incident-free transport and vehicular accidents. The incident-free radiological risk of Latent Cancer Fatalities is 2.14×10^{-1}, the nonradiological risk of health effects from vehicle emissions is 4.01×10^{-1}. The expected number of traffic fatalities is 1.06×10^{-2}. The accident-initiated radiological risk is 1×10^{-6}.

Waste Management and Environmental Restoration Programs. The health risks of transporting low-level waste and mixed waste on the highway were calculated. The results of the transportation risks along the entire route for the 10-year duration of this alternative are shown in Table 5.3-7. Eight vehicle-related fatalities and 108 injuries are estimated. Less than one (0.077) latent cancer fatality is expected. The risks associated under Alternative 3 are higher than the other alternatives because of the large volumes of waste and the greater number of shipments and miles traveled.

Inside Nevada, the vehicle-related fatalities are less than one (0.07), and four injuries are estimated. It is estimated that 0.01 latent cancer fatality would occur in 10 years. Approximately two fatalities and two injuries are expected from on-site transportation of NTS-generated waste and on-site transportation of waste generated off site and shipped to the NTS.

The consequence and probability of the maximum foreseeable accident were calculated for both low-level and mixed waste shipments to the NTS. The most severe consequence from a low-level waste accident would be 2.25×10^{-1} latent cancer fatalities, and 1.04×10^{-1} radiation detriments. The incident free nonradiological risk for waste shipments is 1.20×10^{-2}. The maximum probability of occurrence of this accident would be 8.08×10^{-3}.

For an accident involving mixed waste the radiological consequence would be the same as the low-level waste. For the hazardous chemical portion of the mixed waste, the most severe chemical-induced cancer consequence is 1.1×10^{-6} and the hazard index for the most severe chemical-induced non-cancer is 0.38. The maximum probability of this accident occurring is 3.23×10^{-3}.

5.3.1.3 Socioeconomics. The potential socio-economic effects under Alternative 3 are discussed in this section. The description of socioeconomic

Table 5.3-5 Low-level waste volumes and shipments by generator site[a] under Alternative 3

Generator Site	10-year Volume Projection (m^3)[b]	(yd^3)[c]	Number of Shipments[d]
Aberdeen Proving Ground	790	1,033	21
Ames Laboratory	1,232	1,611	32
Argonne National Laboratory-East	11,265	14,734	296
Bettis Atomic Power Laboratory	9,775	12,788	257
Brookhaven National Laboratory	3,264	4,269	86
Energy Technology Engineering Center	614	803	16
Fermi Laboratory	2,165	2,832	57
Fernald Environmental Management Project	84,177	110,099	2,213
Hanford	170,891	223,517	4,492
Idaho National Engineering Laboratory and Argonne National Laboratory-West	106,934	139,864	2,811
Knolls Atomic Power Laboratory-Kesselring	15,554	20,344	409
Lawrence Berkeley Laboratory	5,099	6,669	134
Lawrence Livermore National Laboratory	1,928	2,522	51
Los Alamos National Laboratory	41,773	54,637	1,098
Inhalation Toxicology Research Institute	344	450	9
Mound	60,027	78,512	1,578
Nevada Test Site	150,000	654	14,000
Oak Ridge National Reservation	26,607	34,801	699
Paducah Gaseous Diffusion Plant	16,996	22,230	447
Pantex Plant	769	1,006	20
Portsmouth Gaseous Diffusion Plant	63,512	83,071	1,670
Princeton Plasma Physics Laboratory	187	245	5
RMI Extrusion Plant	5,528	7,230	146
Rocky Flats Environmental Technology Site	13,759	17,996	2,012
Sandia National Laboratories, CA	219	286	6
Savannah River Site	243,901	319,011	6,411
Stanford Linear Accelerator	3,694	4,832	97
Sandia National Laboratories, NM	351	459	9
West Valley Demonstration Project	67	88	2
Total[e]	**1,041, 422**	**1,362,129**	**39,084**

[a] All volumes are derived from the 1994 Integrated Data Base (DOE, 1995a) and the Waste Management Programmatic EIS (DOE, 1995b) projections. The sites and volumes may change based on the final WMP EIS or updated waste load inventories or projections from the respective DOE sites.
[b] Cubic meters
[c] Cubic yards
[d] Assumes the majority of containers are 1-m x 1-m x 2m (4-ft x 4-ft x 7-ft) boxes
[e] Assumes an average of 12 containers per shipment
[f] Low-level waste
[g] Including internally generated waste.

Table 5.3-6 Mixed waste volumes and shipments by generator site[a], Alternative 3

Generator Site	10-year Volume Projection (m^3)[b]	(yd^3)[c]	Number of Shipments[d,e]
Ames Laboratory	1	1	1
Argonne National Laboratory-East	6,700	8,763	181
Bettis Atomic Power Laboratory	40	52	1
Hanford	120,000	156,954	3,243
Idaho National Engineering Laboratory and Argonne National Laboratory-West	47,390	61,984	1,281
Knolls Atomic Power Laboratory-Kesselring	150	196	4
Lawrence Berkeley Laboratory	4,300	5,624	116
Los Alamos national Laboratory	2,700	3,532	73
Nevada Test Site (ER)[f]	500	196,193	9
Paducah Gaseous Diffusion Plant	600	785	16
Portsmouth Gaseous Diffusion Plant	33,754	44,149	912
RMI Extrusion Plant	25	33	1
Rocky flats Environmental Technology Site	63,000	82,401	9,000
Savannah River site	21, 300	27,859	576
West Valley Demonstration Project	40	52	1
Total[g]	**300,500**	**393,039**	**15,415**

[a] All volumes are derived from the 1994 Integrated Data Base (DOE, 1995a) and the Waste Management Programmatic EIS (DOE, 1995b) inventory projections
[b] Cubic meters
[c] Cubic yards
[d] Assumes the majority of containers are 1-m x 1-m x 2-m (4-ft x 4-ft x 7-ft) boxes
[e] Assumes an average of 12 containers per shipment
[f] Environmental Restroation Program
[g] Includes internally generated waste.

conditions includes indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the site with the three other alternatives. Public finance and public services (public education, police and fire protection, and health) are described. Alternative 1 was considered equivalent to future baseline conditions without new activities. Table 5.3-8 reflects the effects of economic indicators for this alternative, and Table 5.3-9 describes housing projections.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING—Under Alternative 3, it was assumed that direct employment would increase by 867 jobs in 1996, with a maximum increase of 6,718 jobs in 2000, and 4,531 jobs in 2005. It is estimated that direct payroll and purchases of goods and services would generate 2,017 additional secondary jobs in 1996; 12,744 in 2000; and 8,977 in 2005. Of the total employment increase of 13,508 workers, a vast majority (over 97 percent) is expected to live in Clark and Nye counties. Hence, the discussion below concentrates on these two counties.

Table 5.3-7. Transportation risks under Alternative 3

	Transportation Risks	Transportation Risks Inside Nevada	On-site Transportation Risks
Traffic			
Fatalities	8	7×10^{-2}	1
Injuries	108	4	2
Radiation Cancer[a]			
Incident Free[b]	0.077	0.010 ± 0.002	5×10^{-3}
Radiation Detriment[c]			
Incident Free	3.9×10^{-2}	7.9×10^{-3}	4×10^{-3}
Chemical Cancer[d]			
Maximally Exposed Individual[e]	7.5×10^{-5}	9.8×10^{-6}	2×10^{-6}
Chemical Non-cancer (Hazard Index)[f]			
Maximally Exposed Individual	7.9×10^{-3}	1.1×10^{-3}	5×10^{-3}

[a] The number of latent fatal cancers expected due to exposure to ionizing radiation. The cancer can develop and death can occur many years after exposure.
[b] Risk due to routine, normal day-to-day operations without accidents or other unexpected or unusual occurrences.
[c] The total number of health detriment cases due to exposure to ionizing radiation minus the number of latent fatal cancers. Health detriments includes genetic damage and development of nonfatal cancer.
[d] The number of latent cancers expected due to exposure to a chemical carcinogen. Cancer can develop many years after exposure.
[e] For accident risk assessment, inhalation exposure to radioactive or chemical materials is assumed to occur under stable atmospheric conditions (Pasquill atmospheric stability Class F). This results in worst-case of maximum exposure.
[f] The ratio between the daily intake of a noncarcinogenic toxic chemical and acceptable reference level. A hazard index less than one indicates that exposure will not result in adverse noncarcinogenic health effects.

Within Clark County, a total of 2,756 new jobs in 1996; 18,534 jobs in 2000; and 12,857 jobs in 2005 would be generated under Alternative 3. Within Nye County, this alternative would generate 101 new jobs in 1996; 758 in 2000; and 516 in 2005. An increase of 12,857 in Clark County in 2005 would result in a decrease in the County's unemployment rate from 5.8 percent to 4.7 percent. Similarly, in Nye County, an increase of 516 jobs in 2005 would result in a decrease in the County's unemployment rate from 5.2 percent to 4.7 percent.

Because of an increase in employment opportunities, population in-migration is anticipated. It is estimated that 10,020 persons could relocate to Clark County in 2005 resulting in a population increase of 0.7 percent over the Alternative 1 level of 1,380,920 persons. As many as 656 persons may in-migrate to Nye County in 2005. This would result in a population increase of 1.7 percent over the Alternative 1 level of 38,516 persons.

In 2005, an estimated 3,914 households could relocate to Clark County and 246 households to Nye County under Alternative 3. This would result in a reduction of housing vacancy rates from 7.9 percent to 7.2 percent in Clark County and from 16.2 percent to 14.8 percent in Nye County.

Direct earning levels are estimated at $41.2 million in 1996, $330.7 million in 2000, and $224.6 million in 2005. Secondary earnings are estimated at $53.9 million in 1996, $346.1 million in 2000, and $243.0 million in 2005 in the region of influence. Of these earnings, Clark County would gain a

Table 5.3-8. Economic activity effects for Clark and Nye counties 1996, 1997, 1998, 2000, and 2005, totals for all programs under Alternative 3

	1996	1997	1998	2000	2005
Alternative 3					
Clark County					
Population	4	9	1,159,879	1,244,186	1,390,940
	1,078,21	1,115,69			
Total Jobs	510,294	531,649	553,762	594,822	663,270
Unemployment Rate	5.4	4.8	4.8	4.7	4.7
Personal Income ($Millions)	21,436.5	22,903.5	24,381.9	27,099.4	32,913.5
Nye County					
Population	27,497	29,292	31,216	35,014	39,172
Total Jobs	11,091	11,907	12,765	14,379	15,961
Unemployment Rate	4.9	4.7	4.7	4.7	4.7
Personal Income ($Millions)	486.5	534.6	585.7	683.1	812.2
Changes from Alternative 1 (Alternative 3 effects)					
Clark County					
Population	638	3,351	11,638	20,645	10,020
Total Jobs	2,756	7,733	12,940	18,534	12,857
Unemployment Rate	-0.4	-1.0	-1.0	-1.1	-1.1
Personal Income ($1,000)	129.3	377.0	636.2	915.0	632.6
Nye County					
Population	90	374	705	1,048	656
Total Jobs	101	311	530	758	516
Unemployment Rate	-0.3	-0.5	-0.5	-0.5	-.05
Personal Income ($1,000)	5.8	18.7	32.0	46.2	31.5

total of $90.9 million in 1996, $643.2 million in 2000, and $444.7 million in 2005. For Nye County, this economic activity would generate a total of $4.2 million in 1996, $33.6 million in 2000, and $22.9 million in 2005.

Defense Program. In the region of influence, this program would create 532 new jobs, including 160 direct and 372 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 4,584 jobs. By the end of 2005, total employment increase in the region of influence would remain at 4,584. In Clark County, this program would contribute to 4,359 jobs (1,383 direct and 2,976 secondary) in 2005. For Nye County, this program would contribute 178 jobs (109 direct and 69 secondary) in 2005. In 2005, an estimated 1,897 households that support the Defense Program would relocate to Clark County, and 92 households to Nye County, contributing to a decrease in housing vacancy rates. In North Las Vegas, construction of the proposed National Ignition Facility at the North Las Vegas Facility would require 280 workers during the peak year of construction (1998). Operation of the facility would require 330 direct workers in the peak year of 2003 and continue through the duration of National Ignition Facility operations. These activities would generate too few jobs to affect the socioeconomic region of influence.

Waste Management Program. In the region of influence, this program would create 226 new jobs, including 68 direct and 158 secondary jobs, in 1996. In 2000, employment in the region of influence would increase by 1,634 jobs (563 direct and 1,071 secondary). By the end of 2005, total employment would remain at 1,634. In Clark County, the Waste Management Program would contribute 1,553 jobs (493 direct and

Table 5.3-9. Housing projections for the Nevada Test Site region of influence, 1996, 2000, and 2005, under Alternative 3

	Alternative 1 Vacancy Rate (%)	Alternative 3 Housing Demand Increase	Vacancy Rate (%)	Change in Vacancy Rate
Clark County				
1996	7.8	249	7.8	0.0
2000	7.9	8,064	6.3	-1.6
2005	7.9	3,914	7.2	-0.7
City of Las Vegas				
1996	7.1	88	7.0	-0.1
2000	7.1	2,833	5.5	-1.6
2005	7.1	1,375	6.4	-0.7
City of North Las Vegas				
1996	5.9	31	5.8	-0.1
2000	5.9	489	4.6	-1.3
2005	5.9	237	5.4	-0.05
Nye County				
1996	16.2	34	15.9	-0.3
2000	16.2	393	13.6	-2.6
2005	16.2	246	14.8	-1.4
Town of Tonopah				
1996	17.6	5	17.3	-0.3
2000	18.0	51	15.4	-2.6
2005	18.0	27	16.6	-1.4
Town of Pahrump				
1996	11.6	120	11.3	-0.3
2000	11.6	256	8.8	-2.8
2005	11.6	177	10.1	-1.5
Amargosa Valley				
1996	17.8	1	17.5	-0.3
2000	17.9	15	15.3	-2.6
2005	17.8	9	16.4	-1.4

1,060 secondary) in 2005. In Nye County, the Waste Management Program would contribute 64 jobs (39 direct and 25 secondary) in 2005.

With the workload increase in this program, 1,730 persons would relocate to Clark County, and 88 persons to Nye County. In 2005, an estimated 676 households that support this program would relocate to Clark County, and 33 households to Nye County contributing to a decrease in housing vacancy rates.

Environmental Restoration Program. In the region of influence, this program would create 432 new jobs, including 130 direct and 302 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 1,152 jobs. By the end of 2005, total employment would remain at 1,152. In Clark County, this program would add 1,095 jobs (348 direct and 747 secondary) in 2005. For Nye County, this program would add 45 jobs (27 direct and 18 secondary) in 2005.

Because of the workload increase in the Environmental Restoration Program, 1,220 persons would relocate to Clark County, and 62 persons to Nye County in 2005.

An estimated 477 households that support this program would relocate to Clark County and 23 households to Nye County contributing to a decrease in housing vacancy rates.

Nondefense Research and Development Program. In the region of influence, this program would create a total of 170 jobs, including 51 direct and 119 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 467 jobs. By the end of 2005, total employment would remain at 467. Within Clark County, this program would add 444 jobs (140 direct and 304 secondary) in 2005. For Nye County, this program would add 18 jobs (11 direct and 7 secondary) in 2005. With workload increases in the Nondefense Research and Development Program, 495 persons would relocate to Clark County and 25 persons to Nye County.

The demand for housing in the region of influence would increase as a result of the relocation of households associated with the NTS. In 2005, an estimated 193 households that support this program would relocate to Clark County and an estimated 9 households would relocate to Nye County, contributing to a decrease in housing vacancy rates.

Work for Others Program. In the region of influence, this program would create 27 jobs, including 8 direct and 19 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 23 jobs (8 direct and 15 secondary). By the end of 2005, total employment would remain at 23 jobs. In Clark County, this program would contribute 22 jobs (7 direct and 15 secondary) in 2005. In Nye County, the Work for Others Program would contribute at least one job in 2005. Because of the workload increase in this program, 25 persons are anticipated to relocate in Clark County and one person in Nye County.

In 2005, an estimated 10 households that support the Work for Others Program would relocate to Clark County, and one household to Nye County, contributing to a decrease of housing vacancy rates.

Site-Support Activities. Under Alternative 3, additional employment would be required to support increased construction requirements under other programs. In the region of influence, site-support activities would create 1,497 jobs, including 450 direct and 1,047 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 11,632 jobs (4,009 direct and 7,623 secondary). By the end of 2005, total employment would reach 5,648 (1,822 direct and 3,826 secondary). In Clark County, this program would contribute 5,384 jobs (1,708 direct and 3,676 secondary) in 2005. For Nye County, this program would contribute 210 jobs (129 direct and 81 secondary) jobs in 2005.

Because of workload increases in site-support activities, 1,695 persons would relocate to Clark County, and 234 persons to Nye County.

In 2005, an estimated 661 households that support this program would relocate to Clark County, and 89 households to Nye County, contributing to a decrease in housing vacancy rates.

PUBLIC FINANCE—The fiscal impact of all alternatives can be determined by subtracting their income statement totals from the Alternative 1 future baseline. The remaining fiscal impact is the specific impact associated with each alternative. Projected financial summaries are present in Table 5.3-10, and the text makes comparisons to Alternative 1.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed under Public Finance, Section 4.1.3.

Under Alternative 3, revenues for Clark County would increase because of increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures (see discussion on capital projects under Public Finance, Section 4.1.3), Alternative 3 would result in revenues less expenditures of a

Table 5.3-10. Projected financial summary for fiscal years 2000 and 2005, general, special revenues, debt service, and capital projects funds under Alternative 3

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($358,416)	$530,896,729	$1,309,506,535	246.66%
City of Las Vegas	$15,421,723	$198,785,755	$358,736,590	180.46%
City of North Las Vegas	($6,963,735)	$47,524,966	$30,459,795	64.09%
Clark County School District	($14,457,373)	$764,036,602	$125,786,513	16.46%
Nye County	$2,042,525	$26,371,978	$15,921,125	60.37%
Town of Tonopah	$85,400	$653,194	$845,107	129.38%
Town of Pahrump	$240,271	$962,762	$1,657,509	172.16%
Nye County School District	($1,173,255)	$27,521,758	$255,400	0.93%
Fiscal Year 2005				
Clark County	$38,981,856	$565,834,291	$2,154,436,001	380.75%
City of Las Vegas	$17,307,927	$211,713,581	$583,469,805	275.59%
City of North Las Vegas	($6,448,959)	$50,667,058	$48,766,937	96.25%
Clark County School District	($10,871,647)	$854,156,107	$194,428,324	22.76%
Nye County	$3,755,368	$28,214,353	$30,575,821	108.37%
Town of Tonopah	$79,266	$652,617	$1,255,095	192.32%
Town of Pahrump	$327,144	$1,107,419	$3,135,982	283.18%
Nye County School District	$7,669	$30,787,544	$5,863,763	19.05%

negative $358,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures are expected to be $38,982,000. The fund balance (or reserves) as a percentage of current expense is expected to be 247 percent in 2000 and 381 percent in 2005. To compare with Alternative 1, Clark County revenues over expenditures would be $2,144,000 more in 2000 and $1,941,000 more in 2005.

City of Las Vegas. Under Alternative 3, revenues over expenditures for the City of Las Vegas are expected to become positive in Fiscal Year 1995 because of increases in population, personal income, and total employment in the city. Assuming continued increases in revenues and expenditures, this alternative would result in revenues less expenditures of $15,422,000 in Fiscal Year 2000. It is predicted that by Fiscal Year 2005, revenues over expenditures would be $17,308,000. The fund balance as a percentage of current expense is expected to be 180 percent in 2000 and 275 percent in 2005. To compare with Alternative 1, revenues over expenditures would be $1,042,000 more in 2000 and $873,000 more in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue to outpace revenues. Revenues over expenditures in Fiscal Year 2000 would be a negative $6,964,000 and a less negative $6,449,000 in Fiscal Year 2005. This is despite anticipated increases in population, personal income, and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to slowly grow to 1993 levels by Fiscal Year 2000. The fund balance as a percentage of current expense is expected to be 64 percent in Fiscal Year 2000 and 96 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $113,000 more in 2000 and $132,000 more in 2005.

Clark County School District. Under Alternative 3, revenues for the Clark County School District would expand because of increases in population and corresponding school enrollment. Regular program and undistributed expenditures would likely continue to increase. The school district is not predicted to achieve a positive fiscal position by Fiscal Year 2005, even with Alternative 3. With more students and no corresponding increases in revenue by Fiscal Year 2000, revenues less expenditures would be a negative $14,457,000 and, in Fiscal Year 2005, a less negative $10,872,000. The fund balance as a percentage of current expense is expected to be 16 percent in Fiscal Year 2000 and a 0.23 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $610,000 less in 2000 and $296,000 less in 2005.

Nye County. Under Alternative 3, revenues for Nye County would increase slightly because of increases in population, personal income, and total employment in the county. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1996. This alternative would result in revenues less expenditures of $2,043,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,755,000. The fund balance as a percentage of current expense is expected to be 60 percent in Fiscal Year 2000 and 108 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $476,000 more in 2000 and $300,000 more in 2005.

Town of Tonopah. Revenues and expenditures for the town of Tonopah would increase slightly because of increases in population, personal income, and total employment in the county. Assuming continued increases, Alternative 3 would result in revenues less expenditures of $85,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $79,000. The fund balance as a percentage of current expense would be 129 percent in Fiscal Year 2000 and 192 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $6,000 more in 2000 and $4,000 more in 2005.

Town of Pahrump. Under Alternative 3, revenues for the town of Pahrump would increase slightly because of increases in population, personal income, and total employment in the county. Assuming continued increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, this alternative would result in revenues less expenditures of $240,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $327,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 172 percent in Fiscal Year 2000 and 283 percent in the Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $16,000 more in 2000 and $12,000 more in 2005.

Nye County School District. Under Alternative 3, revenues for the Nye County School District would increase slightly because of increases in population. Local sources would continue to generate the most revenue. Assuming small increases in revenues and expenditures, the school district would see a positive level of revenues over expenditures in Fiscal Year 2005. Revenues less expenditures are expected to be a negative $1,173,000 in Fiscal Year 2000 and $8,000 in Fiscal Year 2005. The fund balance as a percentage of current expense is expected to be 0.93 percent in Fiscal Year 2000 and 19 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $229,000 more in 2000 and $128,000 more in 2005.

PUBLIC SERVICES —Table 5.3-11 summarizes the level of service that would be required for Alternative 3, and the following text compares them to Alternative 1. In each case, the current level of service per 1,000 population is assumed to continue.

Public Education. A total of 7,928 full-time equivalent licensed teachers were employed by the Clark County School District in the 1993 to 1994 school year, resulting in a student-to-teacher ratio of 18:33. To continue with this ratio, the Clark County School District would require 11,185 teachers by the school year 2004 to 2005, or 80 more than under Alternative 1. The student-to-teacher ratio for Nye County School District was 16:39 in the 1994 to 1995 school year. Assuming this ratio were to be projected in the school year 2004 to 2005, 390 teachers or 6 more than with Alternative 1 would be required.

Police Protection. Assuming the same level of service in the future, requirements for sworn police and deputy protection in the year 2005 can be examined.

Table 5.3-11. Projected levels of public service for the years of 1996, 2000, and 2005 under Alternative 3

Jurisdiction	Level of Service *	Year 1996	Year 2000	Year 2005
Clark County School District Teachers	18.33	8,670	10,005	11,185
Nye County School District Teachers	16.39	274	349	390
Las Vegas Metropolitan Police Department (Las Vegas and county rural areas)	2.27	1,331	1,536	1,717
North Las Vegas Police Department	1.75	142	164	183
Nye County Sheriff's Office (Tonopah)	3.67	14	16	16
Pahrump Sheriff's Substation	1.85	30	42	52
Beatty Sheriff's Substation	2.59	5	6	5
Amargosa Valley Sheriff's Substation	2.01	2	3	3
Clark County Fire Department (urbanized unincorporated areas)	1.04	441	508	568
Las Vegas Fire Department	0.84	317	365	409
North Las Vegas Fire Department	1.15	93	108	121
Tonopah Volunteer Fire Department	7.09	28	30	30
Pahrump Volunteer Fire Department	1.98	32	45	56
Beatty Volunteer Fire Department and Ambulance Service	14.51	29	32	29
Amargosa Valley Volunteer Fire Department	23.12	27	32	36
Clark County Medical Doctors	1.37	1,481	1,710	1,911
Clark County Registered Nurses	4.84	5,223	6,027	6,738
Nye County Medical Doctors	0.34	9	12	13
Nye County Registered Nurses	1.53	42	54	60

* Level of service is per 1,000 population. The number of school teachers is based on student-to-student ratios, and the number of students is based on a percentage of the population.

The Las Vegas Metropolitan Police Department would require 1,717 sworn police officers or 12 more officers than under Alternative 1. The North Las Vegas Police Department would require 183 sworn officers or 1 more sworn police officer over Alternative 1. The Nye County Sheriff's Office in Tonopah would require 16 sheriff deputies or 1 more deputy sheriff over Alternative 1. The town of Pahrump Sheriff's Substation would require 52, the Beatty Sheriff's Substation would require 5, and the Amargosa Valley Sheriff's substation would require 3. This would lead to the requirement for one more deputy sheriff for the town of Pahrump and none for the Beatty and Amargosa Valley Sheriff's substations.

Fire Protection. It can be assumed that the present level of service based on current population can be projected into the future. The Clark County Fire Department, which handles fires in the urbanized unincorporated county, would be expected to require 568 firefighters in 2005, or 4 more than under Alternative 1. Some 409, or 3 more firefighters, would be required in the Las Vegas Fire Department in the year 2005. The North Las Vegas Fire Department would require 113 or 1 more firefighter. The Tonopah, Pahrump, Beatty and Amargosa Valley Volunteer Fire Departments would require 30, 56, 29 and 36 firefighters, respectively. There are changes of zero, one, one, and zero, respectively, in comparison with Alternative 1.

Health Care. The 1995 level of service for medical doctors and registered nurses was used to determine future needs based on population growth. By 2005, a total of 1,911 (14 more than under Alternative 1) medical doctors and 6,738 (49 more) registered nurses would be required in Clark County. In Nye County, 13 medical doctors and 60 registered nurses would be required, which is the same number of medical doctors and one more registered nurse from Alternative 1.

5.3.1.4 Geology and Soils. The following is a discussion of geologic and soils impacts.

Defense Program. Under Alternative 3, adverse impacts to geology and soils media are the same as those discussed under Defense Program in Alternative 1 (Section 5.1.1.4). Storage of weapons or components of weapons in the Device Assembly Facility and in the P-Tunnel has been proposed and, if implemented, could disturb geologic media. New stockpile management activities at the Device Assembly Facility would disturb approximately 29 acres of surface geologic media. Any additional excavation for this purpose would result in permanent loss of the excavated geologic media and could impact slope stability.

The construction and operation of the proposed National Ignition Facility at the North Las Vegas Facility would have no adverse impact on geological resources. The National Ignition Facility would require about 8 of vacant land. The soils at the North Las Vegas Facility are considered acceptable for standard construction techniques. Soil impacts during construction would be short-term and minor with appropriate standard construction erosion and sediment control measures. The site has been disturbed in the past; therefore, construction impacts would be minor. Net soil disturbance during operation would be less than for construction because areas temporarily used for laydown would be restored. Seismic risks would be taken into consideration during design, construction, and operation activities.

Waste Management Program. Adverse impacts to geologic media discussed for the Waste Management Program under Alternative 1 also apply under Alternative 3. Specific other facilities or actions that could adversely impact geologic media include those listed in Appendix A.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Environmental Restoration Program in Section 5.1.1.4 apply.

Nondefense Research and Development Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Nondefense Research and Development Program in Section 5.1.1.4 apply. Other facilities that could adversely impact geologic media are the Treatability Test Facility and the Area 6 decontamination pad.

Work for Others Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Work for Others Program in Section 5.1.1.4 apply. Other specific actions that could adversely impact geologic media are associated with the demilitarization of conventional weapons.

Site-Support Activities. The impacts associated with site-support activities under Alternative 3 would be the same as those discussed under Alternative 1. Construction of new facilities could adversely impact the geologic media. Impact to geologic media is primarily from clearing of the site, construction of infrastructure, and excavation of aggregate.

5.3.1.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow. Discussions of impacts to water quality and water quantity are also presented.

5.3.1.5.1 Surface Hydrology—The impacts to surface hydrology for the five programs and site-support activities are presented in this section. One potential impact from all the programs would be alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure. Activities could have minor effects on drainage patterns and discharge rates because of surface disturbance and altered infiltration rates.

No surface waters are used for water supplies. The ephemeral waters exist in normally dry washes for short periods of time and on the surface of usually dry lakes for periods of days to weeks. Water quality of the ephemeral waters is poor because of naturally high sediment loads and dissolved solids. Change to sediment loads and dissolved solids due to project activities would be minor compared to the natural baselines. No significant change in water quality or quantity is anticipated, and thus the impacts would be negligible.

Defense Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Defense Program in Alternative 1 apply. The additional facilities and activities included under Alternative 3 could increase the adverse impacts to the surface hydrologic environment that are presented under Alternative 1. Information regarding these facilities is presented in Appendix A.

The proposed National Ignition Facility location at the North Las Vegas Facility is outside the 500-year floodplain of the local drainage. Construction of the National Ignition Facility at the North Las Vegas Facility would be expected to have minor to negligible effects on water quality with the implementation of a stormwater pollution and prevention plan to minimize soil erosion, sedimentation, and contamination of stormwater. Measures would be taken to comply with stormwater discharge regulations associated with construction activities.

Waste Management Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Waste Management Program in Section 5.1.1.5 apply. The additional facilities and activities included under Alternative 3 could increase the adverse impacts to the surface hydrologic environment that are presented under Alternative 1.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Environmental Restoration Program in Section 5.1.1.5 apply.

Nondefense Research and Development Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Nondefense Research and Development Program in Section 5.1.1.5 apply. Specific other facilities that could adversely impact the surface hydrologic environment are the Treatability Test Facility and the Area 6 decontamination pad. The impacts would be the same as those described under Alternative 1.

Work for Others Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Work for Others Program in Section 5.1.1.5 apply.

Site-Support Activities. Under Alternative 3, the impacts to the surface hydrologic environment discussed under site-support activities in Section 5.1.1.5 apply.

5.3.1.5.2 Groundwater—The demand for water resources under Alternative 3 would increase for all programs on the NTS. The major demands would be the Defense Program and a Solar Enterprise Zone facility under the Nondefense Research and Development Program. As a result of the increased demand for water, the impacts for Alternative 3 would be the same as Alternative 1, plus the added effects of the new actions that would be included under Alternative 3.

Defense Program. The impacts of Alternative 3 on the water resources of the NTS include all of the impacts considered under Alternative 1, plus the added impacts of the additional activities. The additional activities would result in a slight increase in water demand relative to Alternative 1, which are reflective of the historical NTS water demand. The additional activities are not expected to affect groundwater quality.

Groundwater would not be used for construction or operation of the proposed National Ignition Facility at the North Las Vegas Facility; all water would be purchased from public suppliers.

Waste Management Program. Under Alternative 3, additional waste disposal capacity would be developed, and minor added water demands would result. It is estimated that 9.251 m^3/yr (7.5 acre-feet per year) of groundwater will be needed for increased waste disposal. No significant adverse impacts are associated with this minor added demand for additional water. It is expected that the additional waste management activities would be similar to ongoing activities and that they would not have an additional impact on the groundwater. The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that have resulted from past underground nuclear tests. Use of the craters for waste disposal and subsequent capping with engineered covers would prevent the downward migration of precipitation into the waste.

The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit from the ground surface to a depth of approximately 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste water unit does not enhance or promote vertical groundwater flow between the waste water unit (subsidence crater) and the deep shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water potential data indicate that there is no groundwater movement from 40 m to 96 m (131 ft to 315 ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (22 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. The Environmental Restoration Program will evaluate the potential for groundwater contamination from shot cavities located in the unsaturated zone (more than 100 m [330 ft] above the water table).

After 30 years of waste disposal operation, groundwater monitoring at the Area 5 Radioactive Waste Management Site has not detected any contamination. In addition, field studies conducted to support the performance assessment, which include monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations would occur during the timeframe covered in this EIS and long into the future (see Appendix A, Section A.2; Chapter 2, Section 2.5.6; and Chapter 4, Section 4.1.5.2 for additional information).

Environmental Restoration Program. For the Environmental Restoration Program, the impacts would be the same as for Alternative 1, but on an

accelerated schedule. Additional restoration actions would be taken, and characterization wells would be drilled at a faster rate.

Acceleration of the Environmental Restoration Program schedule could result in a doubling of characterization water demands to about 246,696 m^3/yr (200 acre-feet per year). The impacts of this increase would not be significant, as the increase represents only a small portion of the available water in all but Yucca Flat.

Because no significant impacts on the water resources were identified and because of constraints on the length of time that would be required for remediation, no significant added impacts are anticipated as a result of accelerated remedial actions under Alternative 3. Small quantities of water would be needed for remedial actions unless active groundwater controls were implemented. In the unlikely event that such controls would be necessary, large-scale groundwater withdrawals (millions of cubic-meter per year [thousands of acre-feet per year]) could be required.

Nondefense Research and Development Program. The water demand for the Nondefense Research and Development Program is likely to be large and would have a significant impact on the availability of the groundwater in the basin in which actions are taken. The peak demand for a Solar Enterprise Zone facility has been estimated at between 4.0×10^5 m^3 and 6.8×10^5 m^3 (3,250 and 5,550 acre-ft/yr), depending on the final array of power-generating options that would be constructed. The alternate fuel vehicle and other demonstration projects would not have appreciable water demands unless large-volume aquifer testing were conducted. Any such occurrences would be evaluated on a case-by-case basis, and National Environmental Policy Act requirements would be met, as needed. Use of water for a Solar Enterprise Zone facility would more than triple the annual water use at the NTS. The impacts of a Solar Enterprise Zone facility on the water resources of the NTS would depend on the location, aquifer, perennial yield, and other water uses in the area. The two candidate sites for the facility are in Area 25 in Fortymile Canyon and Area 22 in Mercury Valley. The perennial yield of Fortymile Canyon is 9.4×10^5 m^3 (7,600 acre-feet per year). The peak historic demand was only 419,384 m^3 (340 acre-ft), leaving as much as 8.9×10^5 m^3 (7,260 acre-ft) of water available. Mercury Valley has a perennial yield of 9.9×10^5 m^3/yr (8,000 acre-ft/yr) and a peak historic demand of only 527,930 m^3 (428 acre-ft), leaving as much as 9.3×10^5 m^3 (7,570 acre-ft) of unappropriated water available.

The perennial yields of the two areas are based on the limited recharge from precipitation and the appreciable underflow from upgradient basins. In Fortymile Canyon, the naturally occurring recharge has been estimated by Scott et al. (1971) to be about 2.8×10^5 m^3/yr (2,300 acre-feet per year), with underflow estimated at 7.2×10^5 m^3/yr (5,800 acre-feet per year). The location of a Solar Enterprise Zone facility in Fortymile Canyon would increase total groundwater withdrawals from 1.2×10^6 to 3.7×10^6 m^3 (1,000 to 3,100 acre-ft) above the recharge from precipitation and would thus capture some of the underflow out of the basin. There may not be a one-to-one correspondence between the quantity of water withdrawn in excess of the perennial yield and the reduction in underflow to downgradient basins. The results of preliminary modeling of the groundwater withdrawals indicates that the groundwater level impacts will be localized within the vicinity of the well and most impacts will be upgradient. It is likely that some groundwater will be removed from storage, a process referred to as groundwater mining and there will be a corresponding decrease in the impact on downgradient discharge rates. The results presented herein are preliminary and are adequate for the purposes of this sitewide EIS. More detailed evaluations will be performed as more detailed information on water use by the facility becomes available and will be presented in lower-tiered National Environmental Policy Act documents prior to the development of the water.

The recharge from precipitation over Mercury Valley is slight, estimated at only 3.1×10^5 m^3/yr (250 acre-ft/yr) by Scott et al. (1971). Existing historic demands for water have exceeded this amount; thus, the development of water supplies for a Solar Enterprise Zone facility in Mercury Valley would likely capture some portion of the underflow

out of the basin into Amargosa Desert (an estimated 2.09×10^7 m³/yr [17,000 acre-ft/yr]).

Sensitive environmental areas downgradient of the NTS include Ash Meadows, Devils Hole, and Death Valley. A recent evaluation of water-level declines in Devils Hole was performed by the Las Vegas Valley Water District (Avon and Durbin, 1994). A statistical analysis of precipitation, water withdrawals in Pahrump Valley, water withdrawals on the NTS, and water levels in Devils Hole was performed as part of this evaluation. The results indicated that there was no relationship between water withdrawals on the NTS to lowering of water levels at Devils Hole. It is considered very unlikely that the withdrawal of the groundwater from the NTS for a Solar Enterprise Zone facility would have any significant adverse impact on downgradient water levels or spring discharge rates.

Site Support Activities. The additional water demand under Alternative 3 includes 3.8×10^4 m³/yr (31 acre-ft/yr) of potable water and 6.5×10^5 m³/yr (525 acre-ft/yr) of nonpotable water. In total, the increase of 6.9×10^5 m³/yr (556 acre-ft) is not a large quantity of water, and added impacts are not considered unless a large portion of that total is withdrawn from Yucca Flat. For Yucca Flat, any increases in groundwater withdrawals would add to the overdraft of groundwater (withdrawals in excess of the perennial yield) of that basin. In Yucca Flat, the total quantity of water needed would be quite small, a few thousands of cubic-meter (tens of acre-feet) at most.

5.3.1.6 Biological Resources. Impacts are as discussed under Alternative 1, except that four major sources of impacts are added: expansion of the Device Assembly Facility for the Stockpile Management project; construction of the large, heavy industrial facilities near the Device Assembly Facility; construction of new facilities for Area 5 Waste Management projects; and implementation of the alternative energy project at one site on the NTS. A total of approximately 15,600 acres could be disturbed under Alternative 3. This represents an increase of 5,700 acres over Alternative 1. A portion of this area (3,000 acres) could be in tortoise habitat on the NTS. Alternative 3 projects could increase the risk of crushing tortoises at construction sites and along roads leading to construction sites. The alternative energy project is sufficiently large that it could negatively affect the viability of some small, local populations of some species if it were sited in an area where those species are found. Given these potential impacts of the alternative energy project, Alternative 3 might reduce biodiversity in the region.

Defense Program. Six defense-related activities would be conducted under Alternative 3. The nuclear emergency response activity would have the same potential impacts described under Alternative 1. The stockpile stewardship activity under Alternative 3 would increase the number of tests to be conducted, which would slightly increase the impact that is described in the introductory paragraph in this section. The hydrodynamic tests and dynamic experiments would be conducted at several appropriate places on the NTS, including two existing facilities in Yucca Flat (the Lyner Complex and the Big Explosives Experimental Facility) and two proposed new facilities. The existing facilities in Yucca Flat are north of the range of the desert tortoise (Rautenstrauch et al., 1994), and operations there are not expected to significantly impact surrounding habitat, the viability of plant or animal populations, or springs.

About 3 acres of habitat would be cleared for each proposed new facility, which would not be enough to influence population viability of plants and animals in these areas. A potential location for the next generator radiographic facility is north of the desert tortoise range. This facility should have no effect on springs. Transportation during construction might be a significant impact on desert tortoises because of the increased risk of crushing individuals along the road.

The stockpile management project includes assembly, disassembly, maintenance, and storage of nuclear devices. Under Alternative 3, a large facility could be built near the Device Assembly Facility in Area 6 to perform all stockpile management functions, including modifying nuclear weapons, quality assurance, testing, and interim storage of pits and components. About 8 acres would be cleared for this facility. Some or all of this land is currently undisturbed habitat. Densities

of desert tortoises are relatively high around this site compared to other sites on the NTS (Blomquist et al., 1995). These tortoises might be crushed during construction and transportation activities for the project (U.S. Fish and Wildlife Service, 1992; DOE/NV, 1993). There are no other endangered, threatened, or candidate species at this site (Blomquist et al., 1995). The loss of habitat and associated mortality of individual plants and animals are not expected to significantly affect the viability of their population.

The new large, heavy industrial facilities under Alternative 3 would involve the disturbance of approximately 600 acres on the NTS in Area 6. No rare plants are known to occur at the site. Construction of these facilities should not affect the viability of the more common plant or animal populations because the disturbances are very small relative to the range of those populations. Desert tortoises might be killed during ground-clearing activities if these facilities were located within the range of desert tortoises. Tortoises also might be killed along roads during transportation activities. All surface-disturbing activities may kill or displace other wildlife such as small mammals, reptiles, and soil-dwelling invertebrates. If ground clearing for construction occurs during the breeding season, the eggs of birds in nests on the ground within a project area may be destroyed. Most birds that breed on the NTS are protected under the Migratory Bird Treaty Act.

Because construction of the large, heavy industrial facilities is the only likely activity to occur during the timeframe covered in this EIS, water demands would be low. Because groundwater used for construction would not be taken from the perched aquifers that supply springs on the NTS (Section 4.1.5.2), this action should have little or no impact on those springs. Given the small quantities of groundwater required, there would be no likely impacts on springs off the NTS during the construction phase. However, pumping the large quantities of groundwater needed during the operation phase of this project could impact off-site springs.

The storage and disposition of weapons-usable fissile materials project could occur within the Defense Industrial Zone in Areas 5 and 6 and in existing tunnels in Area 12. Biological resources could be affected by this activity during transportation of construction and waste material and during operation if there were an accidental release of radionuclides. Neither of these is likely to cause important impacts on biological resources because of the relatively small quantities of waste to be transported and because of the safety protocols in place (See Appendix I of this EIS).

Accidents associated with transport of nuclear devices and components, tritium, and associated radioactive waste for the Defense Program would be unlikely. Impacts on biological resources are unlikely to occur for this reason and because of the small quantities that would be released and the small areas impacted should an accident occur.

No original undisturbed native vegetation remains on the site of the North Las Vegas Facility. Few wildlife species exist at the North Las Vegas Facility because it is located in an urbanized area and contains little vegetation. The only species that exist are those adapted to urban habitats. No biological resource impacts are expected. The North Las Vegas Facility is located within urban Las Vegas on previously disturbed land within a fenced site. It is not expected that any threatened, endangered, or rare species exist. No impacts to threatened and endangered species are expected.

Waste Management Program. At the Area 3 Radioactive Waste Management Site, low-level waste would be buried in existing subsidence craters; four filled disposal cells would be closed. In addition, three additional craters would be used for a total of seven craters. Building 3-302 would be expanded, and a truck decontamination station would be constructed. Impacts of these activities were described for Alternative 1. The amount of undisturbed habitat that would be removed is about the same under Alternatives 1 and 3 because most of the project area is already disturbed.

Approximately 145 acres of previously undisturbed land would be disturbed at the Area 5 Radioactive Waste Management Site because of new construction projects. This would result in the loss of plant and wildlife habitat. Disturbances are not expected to impact viability of plant or animal

populations. Threatened and endangered species are not likely to be impacted by construction given that no desert tortoises have been seen in the area (EG&G/EM, 1994). Several storage pits and disposal units would be closed. Because these disturbed sites would be revegetated, this activity would have a positive impact on habitat. There would be no effects on springs or their associated biota because there are no springs near this site.

Area 6 Waste Management Program activities and impacts would include all that are described for Alternative 1. In addition, a 14 acres Liquid Waste Treatment System would be constructed in Area 6 in 1996 or 1997. Impacts resulting from the construction and operation of the Liquid Waste Treatment System are presented in the Liquid Waste Treatment System Environmental Assessment, issued in 1995. Bird and bat candidate species and economically and recreationally important species like doves and waterfowl (Greger, 1995) could be exposed to hazardous materials or drown in open evaporative tanks constructed for this facility. Off the site, these doves and waterfowl could be harvested, thereby exposing hunters to contaminants. This site is located outside desert tortoise habitat (EG&G/EM, 1991; Rautenstrauch et al., 1994). There would be no effects on springs or their associated biota. Transportation of wastes to Area 6 would be unlikely to have significant impacts on biological resources because of the low probability of an accidental release during transport, the small quantity likely to be released, and the small area impacted should an accident occur. Area 11 Waste Management Program activities would be similar to those under Alternative 1; thus, impacts would be the same.

Environmental Restoration Program. Activities proposed under Alternative 3 are similar to those described under Alternative 1, with the exception that the rate at which these activities would be initiated and completed is likely to be accelerated. This is not likely to change the nature of the impacts; they should remain as described under Alternative 1.

Nondefense Research and Development Program. Five projects within this program would be conducted under this alternative. For four of these projects (Spill Test Facility, Alternate Fuel Demonstration Project, Environmental Management and Technology Development Project, and National Environmental Research Park), the impacts would not be substantially different from those described under Alternative 1. The fifth project within this program, alternative energy, would result in the destruction of large areas of undisturbed habitat and might use massive quantities of water. The Alternative Energy Solar Power Generating Project would involve the development of one of four technologies or subprojects in Areas 22 or 25 capable of generating electricity from solar energy. For this analysis, it was assumed that one of the four technologies would be developed there and that about 2,400 acres of previously undisturbed habitat would be cleared. This loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects should not have a negative impact on the viability of most species found in that area because those species are common throughout a large region. The DOE/NV will consult with the U.S. Fish and Wildlife Service to evaluate the effects, if any, of the Alternative Energy Project on species listed as endangered, threatened, or candidates under the Endangered Species Act. Nests of birds, protected under the Migratory Bird Treaty Act, may also be destroyed if ground clearing for construction of the project occurred during the breeding season.

The abundance of desert tortoises is very low in the vicinity of proposed sites (EG&G/EM, 1991). If tortoises are within or near the chosen site, they might be killed, injured, or displaced during construction and operation of the facilities. Tortoises also are likely to be killed on roads during transportation activities for this project. Up to 6.8×10^6 m^3 (5,500 acre-ft) of water might be pumped annually from the underground aquifer for this project. Because this groundwater would not be taken from the perched aquifers that supply springs on the NTS (Section 4.1.5.2), this action should have little or no impact on those springs. Although the groundwater under the NTS is connected to springs in Devils Hole National Monument and Ash Meadows National Wildlife Refuge, water use at the NTS should affect neither water quality nor quantity in these springs (Section 5.3.1.5). Finally, construction of site-support facilities, such as a 97 km (60 mi) power line from Las Vegas, local water lines, and a 97 km (60 mi) natural gas pipe line, could adversely affect desert tortoises.

Work for Others Program. The Work for Others Program consists of five projects. The treaty verification, nonproliferation, and counterproliferation research and redevelopment projects would consist of the same activities and would have the same impacts under Alternative 3 as are described under Alternative 1. The joint Demilitarization Technology Program involves demonstration projects designed to explore the feasibility of resource and recycling technologies and destruction technologies that could be used to dispose of conventional munitions and solid rocket motors. Some activities would occur in existing underground facilities. Given the location and methods proposed for minimizing and monitoring vented hazardous gases, there are no expected impacts on biological resources. Activities for the second project, defense-related research and development, are similar to those described under Alternative 1. Therefore, the impacts on biological resources would be the same as those described in Section 5.1.1.6.

Site-Support Activities. Under Alternative 3, the NTS site-support activities would be expanded to the extent necessary to provide support for existing activities, as well as new projects and activities not previously performed at the NTS. Scheduled site support activities could remove at least 62 acres of undisturbed habitat. Potential impacts to biological resources are larger under this alternative relative to the other three alternatives. Given the development of several new projects under Alternative 3, it is likely that development to service these new projects would be sizeable. An example would be the construction of a natural gas pipe line from Las Vegas to service some subprojects within the alternative energy project. Projects of this size could have significant impacts on habitat removal and might lead to the death of desert tortoises because of crushing during construction. Based on historic levels of less than or equal to one tortoise killed on NTS roads per year, this increase in traffic might result in the mortality of two to three tortoises per year. This loss should not affect the viability of the tortoise population on the NTS. Given the number of new projects proposed for the Control Point or Device Assembly Facility areas or for areas along the southern boundary of the NTS, it is also likely traffic would become disproportionately common in areas inhabited by tortoises.

5.3.1.7 Air Quality. This section addresses the potential effects that the five programs and the site-support activities on the NTS might have on regional air quality. Emissions from stationary, mobile, and fugitive dust sources, shown in Tables 5.3-12 and 5.3-13, occur within and outside of the NTS. These emissions would be dispersed over the 3,496-km^2 (1,350-mi^2) area of the test site. At the boundaries of the site, ambient pollutant concentrations would be well below the ambient air standards. Carbon monoxide emissions from mobile sources in the Las Vegas Valley nonattainment area would be approximately 90-tons per year (40 percent of 224 tons, see Table 5.3-12 and Section 5.1.1.7). This value is below the 100-ton carbon monoxide de minimus value shown in Table 5.1-14. Therefore, a general conformity analysis would not be required for this alternative.

Defense Program. The air quality of the NTS is subject to periodic disturbance brought about by routine operations and test detonations. About 521 acres of land would be disturbed during Defense Program construction activities under this alternative. The average annual fugitive dust (PM_{10}) emission rate, including various drilling and construction activities, would be about 15.6 tons. These emissions represent 0.002 percent of the total Nye County fugitive emissions (864,600 tons). These calculations assume that fugitive dust would be reduced by 50 percent as a result of watering the sites. Because construction activities are expected to occur only on a short-term basis, long-term air quality impacts are not expected. Nevada Administrative Code 445, Sections 704 to 7165 regulates surface disturbance of 5 acres or more. The Nevada Division of Environmental Protection, Bureau of Air Quality, issued Operating Permit 2743 to the DOE for variable disturbance of land at the NTS. The permit expires in March 1998. There could be gaseous releases associated with new large, heavy industrial facilities. Pollutant concentrations combined with Alternative 1 concentrations would be in compliance with national and state standards. The transfer of Pantex stockpile management operations to the NTS would increase pollutant emissions. The amount of criteria and hazardous air-pollutant-emission increases at the NTS are shown in Tables 5.3-14 and 5.3-15, respectively.

Table 5.3-12. Summary of NTS construction emissions and mobile source emissions (on site and off site) tons per year, Alternative 3

Program	Construction	Mobile Sources								
		On Site			Off Site					
					Nye County			Clark County		
	Fugitive PM_{10}[a]	CO[b]	VOC[c]	NO_x[d]	CO	VOC	NO_x	CO	VOC	NO_x
Defense	15.6	87.21	11.85	15.53	27.14	4.10	9.59	52.69	7.96	18.60
Waste Management	2.3	31.17	4.24	5.55	9.20	1.47	3.43	18.83	2.85	6.65
Environmental Restoration	220.5	21.89	2.97	3.89	6.81	1.03	2.41	13.23	2.00	4.67
Nondefense Research and Development	360	8.91	1.21	1.59	2.77	0.42	0.98	5.38	0.81	1.90
Work for Others	3.0	0.37	0.05	0.07	0.12	0.02	0.04	0.22	0.03	0.08
Site Support Activities	1.8	221.55	31.10	39.46	68.96	10.42	24.36	133.85	20.23	47.26
Total	**603.2**	**371.10**	**50.42**	**66.09**	**115.50**	**17.46**	**40.81**	**224.20**	**33.88**	**79.16**

a PM_{10} = Particulate matter with a diameter equal to or less than 10 micrometers
b CO = carbon monoxide
c VOC = volatile organic compounds
d NO_x = nitrogen oxides

Table 5.3-13. Site-support activities stationary emissions at the NTS and Nye County, tons

Area	TSP[a]	SO_2[b]	NO_x[c]	HC[d]	CO[e]
Area 1	34.70	3.40	2.20	0.10	0.50
Area 2	87.30	0.00	0.00	0.00	0.00
Area 3	24.37	0.00	0.00	0.00	0.00
Area 6	12.33	3.16	59.60	0.94	39.00
Area 23	1.12	10.62	9.40	0.00	2.54
U.S. DOE Portable[f]	17.68	15.24	229.32	0.00	49.68
Fuel Storage Tanks	0.00	0.00	0.00	31.95	0.00
Total NTS	**177.50**	**32.42**	**300.52**	**32.99**	**91.72**
Total Nye County	**1,685.70**	**960.68**	**933.28**	[g]	**187.68**

[a] Total suspended particulates
[b] Sulfur dioxide
[c] Nitrogen oxides
[d] Hydrocarbon
[e] Carbon monoxide
[f] Compressors
[g] No data: State hydrocarbon emission inventory is not complete.

Source: Bureau of Air Quality, State of Nevada, 1995.

Table 5.3-14. Stockpile management facilities criteria pollutant summary

Pollutant	Pounds per Year	Tons Per Year
CO[a]	49,589.01	24.79
NO_x[b]	119,173.42	59.59
PM[c]	18,604.74	9.30
SO_2[d]	0.22	0.00
Total	**187,367.39**	**93.68**

[a] Carbon monoxide
[b] Nitrogen oxides
[c] Particulate matter
[d] Sulfur dioxide.

Source: Pantex Plant Environmental Information Document, 1995.

Table 5.3-15. Stockpile management facilities hazardous air pollutants emissions summary* under Alternative 3 (Page 1 of 2)

Pollutant	Chemical Abstracts Service (CAS #)	Pounds per Year	Tons per Year
1,1,1-chloroethane	75003	50.14	0.03
1,1,2-trichloroethane	79005	8.34	0.00
2-nitropropane	79469	3.76	0.00
Benzene	71432	201.49	0.10
Carbon Disulfide	75150	59.64	0.03
Carbon Tetrachloride	56235	34.36	0.02
Chlorobenzene	108907	3.94	0.00
Chromium	7440473	4.71	0.00
Cresol	1319773	0.11	0.00
Cresylic Acid	1319773	0.11	0.00
Dibenzofuran	132649	0.16	0.00
Ester Glycol Ethers	Not Applicable	1.89	0.00
Ethene, tricholor	79016	3.48	0.00
Ethyl Benzene	100414	3.34	0.00
Ethylene Dichloride	107062	2.93	0.00
Formaldeyde	50000	127.62	0.06
HCL	7647010	2,438.56	1.22
HF	7664393	2,592.76	1.30
Ketones	Not Applicable	0.061	0.00
Lead	7439921	408.37	0.20
Mercury	Not Applicable	0.00	0.00
Methane Dichloro	75092	12.35	0.01
Methanol	67561	2,411.40	1.21
Methyl Ethyl Ketone	78933	15,581.44	7.79
Methyl Isobutyl Ketone	108101	1.36	0.00
Methylene Chloride	75092	401.39	0.20
Naphthalene	91203	0.90	0.00

Table 5.3-15. Stockpile management facilities hazardous air pollutants emissions summary* under Alternative 3 (Page 2 of 2)

Pollutant	Chemical Abstracts Service (CAS #)	Pounds per Year	Tons per Year
Nickel	7440020	0.36	0.00
Nitrobenzene	98953	0.11	0.00
Phenol	108952	4.92	0.00
Tetrachloroethylene	127184	14.19	0.01
Toluene	10883	1,027.29	0.51
Trichloroethylene	79016	43.00	0.02
Triethylamine	121448	0.00	0.00
Xylene	1330207	489.75	0.25
Total		**25,933.72**	**12.96**

* Amounts less than 0.01 lb/yr or less than 0.01 tons/yr are listed as 0.00.

Source: Pantex Plant Environmental Information Document, 1995.

These emissions are based on the 1993 Pantex emission inventory (Pantex, 1995). The stationary-source criteria pollutant emissions would increase 20 to 30 percent above those shown in Table 5.3-13. If the emissions from the large, heavy industrial facilities were included, emission increases could require a Prevention of Significant Deterioration permit application. The NTS would be considered a major source under Prevention of Significant Deterioration requirements (potential to emit 250 tons per year or more of any air pollutant subject to regulation under the Clean Air Act).

Military aircraft conduct training exercises in the airspace over the NTS, and the pollutant emissions released from these aircraft are distributed over a large area. A study has shown that pollutant ambient air standards. Carbon monoxide emissions from mobile sources in the Las Vegas Valley nonattainment area would be approximately 90-tons per year (40 percent of 224 tons, see Table 5.3-12 and Section 5.1.1.7). This value is below the 100-ton carbon monoxide de minimus value shown in Table 5.1-14. Therefore, a general conformity analysis would not be required for this alternative.

Defense Program. The air quality of the NTS is subject to periodic disturbance brought about by routine operations and test detonations. About 521 acres of land would be disturbed during Defense Program construction activities under this alternative. The average annual fugitive dust (PM_{10}) emission rate, including various drilling and construction activities, would be about emissions from operations contribute no more than 0.05 percent of the allowable ambient concentrations (SAIC/DRI, 1991). Thus, these military aircraft operations have a negligible impact on air quality over the NTS. Aircraft operations at Desert Rock Airport (Mercury) are relatively low (3,500 to 4,000 operations per year); therefore, the emissions resulting from related air and ground activities would be negligible (SAIC/DRI, 1991).

Operation of the proposed National Ignition Facility in North Las Vegas would generate criteria and toxic/hazard pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators, and solvent cleaning processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead,

and volatile organic compounds. Boiler fuel is assumed to be liquefied petroleum gas. Concentrations of pollutants resulting from operation of the proposed National Ignition Facility added to existing concentrations are expected to be within federal and state regulation levels. For additional information, consult the *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE,1996).

Waste Management Program. The NTS Waste Management Program activities are conducted in four primary areas: Areas 3, 5, 6, and 11. About 75 acres of land would be disturbed over a 10-year period. The average annual fugitive dust emissions (PM_{10}) would be about 2.3 tons. Most of the fugitive dust would be generated during the construction of a new waste storage site.

Calculations assume that fugitive dust would be reduced 50 percent as a result of watering the sites. Because construction activities are expected to occur only on a short-term basis, long-term air quality impacts are not expected.

Environmental Restoration Program. The total fugitive dust emissions (PM_{10}) generated from environmental restoration projects would be about 221 tons per year, compared with the total fugitive dust (PM_{10}) emissions generated in Nye County, which would be about 866,400 tons per year. The total Environmental Restoration Program emissions represent about 0.03 percent of the county's PM_{10} burden.

Nondefense Research and Development Program. One Nondefense Research and Development Program at the NTS with Alternative 3 could impact air quality. The Solar Enterprise Zone facility would be the site of a 100-megawatt (MW) solar generation facility, which would be located in either Area 22 or Area 25. It was assumed that the maximum disturbed area for the facility would be 2,402 acres, and the construction period would be two years. Annual fugitive dust (PM_{10}) emissions would be approximately 360 tons.

Work for Others Program. Under Alternative 3, the use of NTS airspace and certain land by the DoD for training, research, and development would continue and possibly increase. The approximately 10 acres of land disturbance with this program would cause 3 tons of PM_{10} emissions.

Site-Support Activities. Stationary sources at the NTS for emissions include the shaker plant, boilers, aggregate crushing and processing, a concrete batch plant, and fuel storage tanks. Portable compressor emissions are also included. The construction of a large, heavy industrial facility in Area 6, would contribute to the emissions. About 30 acres of land would be disturbed for new facility construction, generating 1.8 tons of PM_{10}.

RADIOACTIVE AIR QUALITY—Air concentrations would have to be 14 times higher than the measured 1993 average concentrations to achieve the maximum CAP-88 air dose assessment modeled dose (see Section 4.1.7). Average concentrations from the five programs and site- support activities are estimated never to equal or exceed this amount. Impact to air quality by radioactive effluents under Alternative 3 would be minimal.

5.3.1.8 Noise. Because of its large size (3,496 km^2 [1,350 mi^2]), noise generated on the NTS does not propagate off site at audible levels. The closest sensitive receptors to the site boundary are residences located 2 km (1.3 mi) to the south in the town of Amargosa Valley. Therefore, NTS noise impacts for this alternative are a result of noise generated during the operation of construction equipment and from the transportation of personnel and materials to and from the site. The NTS total construction and operations workforce under this alternative would increase from 1996 to 2005.

Railroad and aircraft noise was considered. No railroads serve the NTS; therefore, railroad noise impact analyses were not required. Based on composite noise contours developed by the U.S. Air Force in 1994 for subsonic and supersonic flight operations over the NAFR Complex (U.S. Air Force, 1994), the day-night average sound level (L_{dn}) on the NTS portion of the complex resulting from aircraft operations would be less than 50 db. Flight operations at supersonic speeds are not authorized over the NTS (SAIC/DRI, 1991), and subsonic operations are not normally scheduled

over the eastern portion of restricted area R-4808, which includes most of the NTS (U.S. Air Force, 1994). Only periodic helicopter and small fixed-wing aircraft operations are conducted from Desert Rock Airport. All noise impacts under Alternative 3 would be the same as those under Alternative 1, with additional impacts resulting from an increase in training exercises.

At the North Las Vegas Facility, the noise background levels are those that would be expected in an urbanized industrial area. No anticipated impacts from additional noise are anticipated for operations activities. Construction activities would contribute a small portion of noise temporarily.

5.3.1.9 Visual Resources. An analysis has been conducted to determine the effects of Alternative 3 activities on visual resources. Visual impacts were assessed on the potential of activities to alter or conflict with the existing landscape character.

Defense Program. Under Alternative 3, a total of 1,000 acres of new ground disturbance is anticipated to occur for projects related to the Defense Program. The projects would be located in areas of scenic quality common to the area. Most of this ground disturbance would be associated with new construction at the Device Assembly Facility in Area 6, and the large, heavy-industrial facilities, which have not been sited. Area 6 is currently used for large, heavy industrial activities. It is not anticipated that these facilities would be seen from public viewpoints. Therefore, impacts to visual resources resulting from facility construction and operation on visual resources would be negligible.

Under Alternative 3, a nuclear test would be conducted if directed by the President. Underground testing likely would be conducted in existing drill holes. The test would occur in the existing testing areas that do not have high scenic value and are not visible from public viewpoints. Therefore, impacts to visual resources caused by testing would be negligible.

The North Las Vegas Facility occupies approximately 80 acres in the city of North Las Vegas, Nevada. The area can be described as an urbanized industrial area, and visual resources are typical for such an area. No additional impacts are expected to visual resources.

Waste Management Program. The Waste Management Program would generate approximately 209 acres of new ground disturbance under Alternative 3. The new facilities would be located in areas of scenic quality common to the region, near similar facilities in areas that are already disturbed. None of the Waste Management Program projects would be visible from any public viewpoints. Therefore, impacts to visual resources from waste management operations would be negligible.

Environmental Restoration Program. Under Alternative 3, the Environmental Restoration Program would generate approximately 50 acres of new ground disturbance. Environmental Restoration Program activities would be located in areas of scenic quality common to the region, and none would be visible from any public viewpoints. Depending on pertinent reclamation factors, disturbed areas would be revegetated after remediation is completed. Adverse impacts would be negligible. There would be some beneficial impacts to visual resources once vegetation is reestablished.

Nondefense Research and Development Program. The Nondefense Research and Development Program would cause approximately 2,400 acres of new ground disturbance for the construction of a Solar Enterprise Zone facility. A Solar Enterprise Zone facility is proposed to be located on the southern NTS boundary (Area 22) and would be visible from U.S. Highway 95. However, the scenic quality is classified as Class C. The landscape character of the area is common to the region, and there is a minor amount of existing manmade modification in the highway viewshed. Because of the size of the area affected and the visibility from Highway 95 (a view corridor with a high sensitivity level) there would be adverse impacts to visual resources.

Work for Others Program. Only 10 acres of new ground disturbance would occur for this program under Alternative 3. Although most Work for Others Program activities are proposed for existing

facilities, some new construction would occur. Most of the ground disturbance would be related to construction of the facilities. The new facilities would be constructed near existing facilities, which are located in areas with common scenic quality and are not visible from public viewpoints. Therefore, impacts would be negligible.

Site-Support Activities. Approximately 30 acres of new ground disturbance would occur for site-support activities under Alternative 3. Most of the ground disturbance would be related to new road and utility corridor construction to support expanded programs. Ground disturbance would be scattered throughout the NTS. Impacts to visual resources would be negligible.

5.3.1.10 Cultural Resources. The amount of acreage disturbed as a result of activities described for Alternative 3 would increase substantially as compared to Alternative 1. All activities as proposed under Alternative 1 are proposed under Alternative 3 with the addition of construction of fifteen buildings, expansion of waste management and disposal areas, increased road construction, expansion of communications, water control systems and flood protection, increased cleanup activities, and an expansion of power lines and gas lines. A total of 15,600 acres are expected to be disturbed under Alternative 3. Continued visitation and vehicular traffic could lead to vandalism or artifact collecting that could directly affect recorded archaeological sites and archaeologically sensitive areas.

Although archaeological surveys have not been conducted in these areas, it is estimated that more than 67 sites could be impacted by projects associated with this alternative based on surveys conducted in adjacent areas in 1994. The precise location and number of these resources are unknown until archaeological surveys are conducted. Surveys will be conducted prior to any ground-disturbing activities, and impacts would be mitigated through the measures described in Chapter 7. At least eight structures will be decommissioned under Alternative 3. If these buildings are determined to be historically significant, they would be mitigated using measures described in Chapter 7.

Defense Program. Additional impacts are expected from ground disturbances associated with the construction of facilities, upgrading utilities, and construction of a waste management complex. Increased visitation and vehicular traffic in archaeologically sensitive areas could have indirect impacts. All surveys will be performed prior to any ground-disturbing activities or expansion of existing facilities.

At North Las Vegas, the construction and operation of the proposed National Ignition Facility would have no effect on archaeological sites or historic structures that are listed on or eligible to be listed on the National Register of Historical Places or Native American cultural resources.

Waste Management Program. Under Alternative 3, waste management would expand and additional facilities would be constructed in Area 3 and Area 5 at the NTS. An increase in ground disturbance, and an increase in visitation could have an impact on cultural resources.

Environmental Restoration Program. Impacts to cultural resources are the same as those contained in Alternative 1.

Nondefense Research and Development Program. Additional impacts may occur through construction of the Natural Gas facility.

Work for Others Program. Impacts are the same as contained in Alternative 1.

AMERICAN INDIAN CULTURAL RESOURCES—This section contains the description of the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

Defense Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if new Defense Program operations are undertaken or if current underground nuclear tests are expanded into previously unused areas. Access to culturally significant places will be reduced because Indian peoples' perception of health and spiritual risk will increase if additional testing, storage, disassembly,

or disposal of nuclear and conventional weapons occur.

Waste Management Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will continue to be adversely impacted, in particular, if waste storage facilities are expanded because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted by an expansion of the monitoring well program and access road activities, but will be positively impacted by actions that return disturbed land to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted by increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals. Cultural resources will be positively impacted if students and researchers receive proper guidance by Indian people regarding how to visit places and interact with the environment.

Work for Others Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be impacted if the NTS continues to be a place where weapons are stored, disassembled, and disposed. These actions have and will continue to pollute these lands. The presence of conventional and nuclear weapons defines the NTS as a place of destruction which promotes an image that is inappropriate for a place for peaceful relations between Indian ethnic groups. American Indian cultural resources will continue to be impacted by military training exercises and weapons tests.

Defense Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if nuclear safety tests continue or increase and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will not be adversely impacted because there is no Waste Management Program on the Area 13 site on the NAFR complex and none has been identified for this alternative.

Environmental Restoration Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources of the Area 13 site on the NAFR Complex be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will increase if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during research and development. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Work for Others Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs continue or are expanded at the Area 13 site. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.3.1.11 Occupational and Public Health and Safety. Alternative 3 includes all program activities

described under Alternative 1, plus additional activities. For NTS workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared with Alternative 1. Table 5.3-16 summarizes the occupational and public health and safety impacts to construction and operations and maintenance personnel for each NTS program area under Alternative 3. Increased impacts to public health and safety can also be anticipated under Alternative 3. For routine activities, these impacts are primarily related to routine air emissions and transportation activities. Potential impacts to the public from routine air emissions of radioactivity and priority pollutants are discussed in Section 5.3.1.7, Air Quality. Transportation impacts are discussed in Section 5.3.1.2. This section contains the discussion of potential impacts to public health and safety from subsurface contamination of groundwater and from accidental releases of radioactivity to the air.

Unless otherwise noted, impacts presented in this section are the total impacts for the 10-year period evaluated in this EIS. Results are presented for each program area although some program areas do not involve hazards from radiation or hazardous chemicals.

Defense Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected increases in the worker population under Alternative 3, Defense Program activities at the NTS are expected to result in 3.7 injuries to workers during routine program activities and in 61 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.0066 fatalities are expected because of routine activities, and 0.11 fatalities are expected from construction activities. Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Defense Program workers of about 115-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.046 latent cancer fatalities and 0.018 other detrimental health effects in the worker population. Risk of accidental exposure to workers increases the latent cancer fatality risk by 0.005 and the risk of other detrimental health effects by 0.002. No Defense Program hazardous chemical accident resulting in measurable effects at the NTS has been identified.

The health and safety impact to the public from potential Defense Program accidents could result in about 4.4×10^{-6} latent cancer fatalities and 2.0×10^{-6} other detrimental health effects in the population. Should the DOE be directed by the President to conduct underground nuclear-yield testing under Alternative 3, potential accidents associated with venting of radionuclides following a test could result in a risk of about 0.0054 latent cancer fatalities and 0.0025 other detrimental health effects in the population.

The maximum reasonably foreseeable Defense Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an explosion of high explosives associated with interim stored nuclear weapons at the Area 27 storage bunkers, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

No Defense Program accident resulting in measurable chemically hazardous effects at the NTS has been identified.

Subsurface radioactivity from past underground nuclear weapons tests would continue to be a potential exposure pathway for the public under Alternative 3. Potential impacts to the public would be identical to those described under Alternative 1. The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-11} (about one in one trillion) and 1×10^{-5} (about one in 100,000). The public exposure scenario assumes that the individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water. These impacts are not expected to occur within the 10-year timeframe of this EIS.

Table 5.3-16. Health risks to workers and the public from program activities, Nevada Test Site, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense (with nuclear testing)	65	0.12	0.051 (0.053)	0.020 (0.021)	e	e	4.4×10^{-6} (0.0054)	2×10^{-6} (0.0025)	e	e
Waste Management	467	8.7	0.0025	0.010	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2×10^{-5}	3.8×10^{-6}
Environmental Restoration	11	0.035	0.0096	0.0036	3×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6×10^{-8}	2.4×10^{-8}
Nondefense Research and Development	8.6	0.015	0.0042	0.0017	3.2×10^{-6}	0.58	f	f	1.9×10^{-4}	1.5×10^{-4}
Work for Others	11	0.019	0.0055	0.0023	8.9×10^{-8}	2.4	2×10^{-7}	9.2×10^{-8}	4.2×10^{-7}	6.4×10^{-7}
Site Support Activities	210	0.37	0.054	0.021	e	e	f	f	e	e
Total (with nuclear testing)	**773**	**9**	**0.13 (0.18)**	**0.059 (0.08)**	**4.1×10^{-6}**	**2.4**	**5.6×10^{-5} (0.0055)**	**2.5×10^{-5} (0.0025)**	**2.3×10^{-4}**	**1.5×10^{-4}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis.
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis.
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis.
d. A hazard index of greater than one indicates that the non-cancer health effects could be life threatening to individuals exposed for one hour or more.
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.
f. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

For the North Las Vegas Facility, the occupational and public health and safety impacts described in this section are based on analyses documented in the Draft Programmatic EIS for Stockpile and Managmement (DOE, 1996). Potential radiation exposures to workers inside the proposed National Ignition Facility would be kept as low as reasonably achievable through facility design and administrative controls. The average worker inside the facility is estimated to receive about 30 millirem per year, and the worker population inside the facility is estimated to receive a collective dose of 10 person-rem per year. Over the 10-year period of activities considered by the NTS EIS, workers could receive a total dose of 100 person-rem which would result in a risk of 0.04 (about 1 in 25) of a single latent cancer fatality in the worker population. Other workers at the North Las Vegas Facility outside the National Ignition Facility are estimated to receive a collective dose of 0.07 person-rem per year, or a maximum of 0.7 person-rem over 10 years with a corresponding cancer fatality risk of 2.8×10^{-4} (about 1 in 4,000).

Potential radiation exposures to the public within 80 kilometers (50 miles) of the proposed National Ignition Facility would be well within regulatory limits. The maximally exposed public individual is estimated to receive an annual dose of 0.6 millirem per year, which is much less than the limit of 100 millirem per year from all DOE sources. Over the 10-year period of activities considered by the NTS EIS, this individual could receive a total dose of 6 millirem resulting in a risk of 3×10^{-6} (about 1 in 300,000) of contracting a fatal cancer. The entire population within 80 kilometers is estimated to receive a collective dose of 0.6 person-rem per year, or 6 person-rem over 10 years with a corresponding risk of 0.003 (about 1 in 300) of a single latent cancer fatality in the exposed population.

No routine impacts from hazardous chemicals would be expected to occur because only minute quantities of volatile organic compounds are expected to be emitted during routine operations.

The maximum reasonably foreseeable radiological accident associated with the proposed National Ignition Facility involves a severe earthquake that occurs during a maximum-credible-yield fusion experiment. The collapse of beamlines and building structures would potentially result in atmospheric releases of tritium in the tritium processing system, activitated gases in the air, and activated material in the target chamber. The joint frequency of a severe earthquake during a maximum-credible-yield fusion experiment would be less than 2×10^{-8} per year. If this accident occurred, workers at the North Las Vegas Facility could receive a collective dose of 47 person-rem resulting in a risk of 0.019 (about 1 in 50) of a single latent cancer fatality among the worker population. The maximally exposed public individual could receive a dose of 68 millirem resulting in a latent cancer fatality risk of 3.4×10^{-5} (about 1 in 30,000). The population within 80 kilometers could receive a collective dose of 4,900 person-rem per year, potentially resulting in two to three latent cancer fatalities among the exposed population.

The maximum reasonably foreseeable chemical accident associated with the proposed National Ignition Facility involves an accidental release of mercury. People within 239 m (784 feet) of the release could experience adverse health effects from mercury inhalation if not protected (i.e., sheltering inside building, breathing protection). The nearest members of the public would be 210 m (689 ft) west of the facility. The personnel in nearby buildings would likely be protected because the release (typically lasting 15 minutes) would pass by the buildings with little infiltration. Personnel in the NIF Laser and Target Area Building and those outside in the immediate vicinity might be affected.

Waste Management Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected increases in the worker population under Alternative 3, the Waste Management Program at the NTS is expected to result in 440 injuries to workers during routine program activities and 27 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 8.7 fatalities are expected because of routine activities, and 0.048 fatalities are expected from construction activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Waste Management Program workers of about 23-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0092 latent cancer fatalities and 0.0037 other detrimental health effects in the worker population. The risk of accidental exposure increases the latent cancer fatality risk by 0.016 and detrimental health effect risk by 0.0064. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Waste Management Program hazardous chemical accidents has a hazard index of 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents could result in about 5.1×10^{-5} latent cancer fatalities and 2.3×10^{-5} other detrimental health effects in the population. Waste Management Program accidents involving hazardous chemicals could result in about 2.0×10^{-5} cancers in the population. No noncancer effects from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6×10^{-7} (1 in 1,700,000) per year.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 hazardous waste storage unit, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

Environmental Restoration Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected increases in the worker population under Alternative 3, Environmental Restoration Program activities at the NTS are expected to result in 8.8 injuries to workers during routine program activities and 2.5 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.03 fatalities are expected from routine activities, and 0.0044 fatalities are expected from construction activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Environmental Restoration Program workers of about 23-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0093 latent cancer fatalities and 0.0037 other detrimental health effects in the worker population. The risk of accidental worker exposure to hazardous chemicals increases the risk of fatal or nonfatal cancer in the worker population by 2.8×10^{-7}. The risk of life-threatening noncarcinogenic effects to workers from Environmental Restoration Program hazardous chemical accidents has a hazard index of 0.14.

The health and safety impact to the public from potential Environmental Restoration Program radiological accidents could result in about 2.3×10^{-10} latent cancer fatalities and 1.1×10^{-10} other detrimental health effects in the population. Environmental Restoration Program accidents involving hazardous chemicals could result in about 1.6×10^{-5} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 13 site, which has a probability of occurrence of 7×10^{-7} [1 in 1,400,000]) per year.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS, which has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year.

Nondefense Research and Development Program. Based on occupational injury and fatality rates for construction activities and on projected increases in the worker population under Alternative 3, Nondefense Research and Development Program activities at the NTS are expected to result in 8.6 injuries and 0.015 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of routine activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Nondefense Research and Development Program workers of about 11-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0042 latent cancer fatalities and 0.0017 other detrimental health effects in the worker population. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 3.2×10^{-6}. The risk of life-threatening noncarcinogenic effects to workers from Nondefense Research and Development hazardous chemical accidents has a hazard index of 0.58.

The health and safety impact to the public from potential Nondefense Research and Development Program accidents could result in about 1.9×10^{-4} cancers in the population. No hazardous chemical noncancer effects to the public from chemical accidents would be expected to occur.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the tank farm at the Fuel Spill Test Facility, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

Work for Others Program. Based on occupational injury and fatality rates for construction activities and on projected increases in the worker population under Alternative 3, Work for Others Program activities at the NTS are expected to result in 11 injuries and 0.019 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of routine activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Work for Others Program workers of about 14-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0055 latent cancer fatalities and 0.0022 other detrimental health effects in the worker population. The risk of accidental exposure increases the latent cancer fatality risk by 0.002 and detrimental health effect risk by 0.001. The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 8.9×10^{-8}. The risk of life-threatening noncarcinogenic effects to workers from Work for Others Program hazardous chemical accidents has a hazard index of 2.4.

The health and safety impact to the public from potential Work for Others Program radiological accidents could result in about 2.0×10^{-7} latent cancer fatalities and 9.2×10^{-8} other detrimental health effects in the population. Work for Others Program accidents involving hazardous chemicals could result in about 4.2×10^{-7} cancers in the

population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Work for Others Program radiological accident at the NTS would be an inadvertent detonation of a test assembly at the Big Explosives Experimental Facility and release of 1,000 ci of tritium, which has a probability of occurrence of 3×10^{-5} (1 in 33,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 0.35 rem, 1.4×10^{-4} chance of latent cancer fatality, 5.6×10^{-5} chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 0.006 person-rem, 2.4×10^{-6} chance of a single latent cancer fatality, 9.6×10^{-7} chance of any other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 4.7×10^{-5} rem, 2.4×10^{-8} chance of latent cancer fatality, 1.1×10^{-8} chance of other detrimental effects
- Population within 80 km (50 mi), 0.02 to 0.35 person-rem, 1.0×10^{-5} to 1.8×10^{-4} chance of latent cancer fatality, 4.6×10^{-6} to 8.1×10^{-5} chance of other detrimental effects.

For Work for Others Program hazardous chemical effects, the maximum reasonably foreseeable accident would be a depleted uranium and beryllium release as a result of an unplanned detonation of a test assembly at the Big Explosives Experimental Facility, which has a probability of occurrence of 1×10^{-3} (1 in 1,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 8.0×10^{-4} chance of fatal or nonfatal cancer, 240 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 2.8×10^{-6} chance of a single cancer, 0.023 noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 6.3×10^{-7} chance of cancer, 6.4×10^{-5} noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 1.3×10^{-5} to 5.6×10^{-7} chance of a single cancer, 6.4×10^{-5} noncancer hazard index for potentially life-threatening one-hour concentration.

Site-Support Activities. Under Alternative 3, site-support activities at the NTS are expected to result in 210 injuries and 0.37 fatalities as result of construction activities during the 10-year period evaluated in this EIS. No injuries or fatalities are projected as a result of routine site-support activities.

Occupational exposure to radiation is expected to result in a collective dose to NTS site-support workers of about 135-person rem in 10 years. This dose could result in about 0.054 latent cancer fatalities and about 0.022 other detrimental health effects in the worker population.

Perceptions of radiation effects are discussed in Section 5.1.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see out land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO.

At this time there has not been a systematic study of American Indian's perception of risk. Therefore, it is not possible to provide action-by-action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and why we will continue to respond to future DOE activities.

5.3.1.12 Environmental Justice. Environmental Justice analysis is conducted in two steps. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The CGTO has identified impacts to American Indian groups as a result of Alternative 3. While not physically located in Clark, Nye, or Lincoln Counties, these groups have traditional ties to the NTS and surrounding areas. Impacts would include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. Because of the expansion of activities under Alternative 3, potential impacts would be greater than those listed under Alternative 1. These impacts would be perceived only by American Indian groups and would, therefore, be a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.2.1.10, Cultural Resources, and 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present and future activities on the NTS have, are, or will disproportionately impact these American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Action-by-action responses are accessed in Section 5.1.1.12 and are not repeated here.

5.3.2 Tonopah Test Range

Under Alternative 3, the Defense, Environmental Restoration, and Work for Others Programs at the Tonopah Test Range would continue. In addition, a variety of proposed tests would be conducted at the Tonopah Test Range. The activities associated with Alternative 3 are summarized below. A detailed description of the activities is presented in Appendix A.

Defense Program. Under Alternative 3, Tonopah Test Range activities would include the same activities as under Alternative 1, with the addition of a variety of proposed tests. The proposed tests would include robotics, smart transportation, a variety of burn tests, smoke obscuration operations, thermal test operation facility, climatic test operation facility, armor/antiarmor tests, and infrared tests.

Environmental Restoration Program. Environmental Restoration Program activities would continue at current or accelerated rates.

Work for Others Program. Current Work for Others Program activities would continue at the Tonopah Test Range. Activities would be the same as those described for Alternative 1 in Section 5.1.2.

Site-Support Activities. Site-support activities under Alternative 3 would be increased as a result of increased activities at the Tonopah Test Site.

5.3.2.1 Land Use. Under Alternative 3, the actions taken at the Tonopah Test Range would be the same as for Alternative 1, including the addition of Nondefense Research and Development and Work for Others Programs. The Environmental Restoration Program would accelerate its schedule.

Defense Program. Alternative 3 would include all activities identified under Alternative 1 and any increase of defense-related missions not evaluated in the baseline, resulting in more demands on the airspace by the DOE. This would require additional coordination with the U.S. Air Force to ensure both missions are accommodated.

Environmental Restoration Program. Two Environmental Restoration Program projects at the Tonopah Test Range could result in land disturbance under Alternative 3. One project would consist of the restoration of approximately 200 acres for the Soils Media Corrective Action Unit. The second project would consist of 43 Environmental Restoration Program sites identified at the Tonopah Test Range.

Impacts to land-use resources from Environmental Restoration Program activities would be mostly beneficial, making contaminated lands usable subject to restrictions and tenant uses. Adverse impacts would be negligible. The 1,025 acres identified for Environmental Restoration Program projects would represent less than 0.3 percent of the Tonopah Test Range land area.

Work for Others Program. Under Alternative 3, the activities conducted would be similar to those activities identified under Alternative 1 and other Defense Program activities. Therefore, the impact would be similar.

5.3.2.1.1 Site-Support Activities—Site-support activities under Alternative 3 would include those identified under Alternative 1, as well as any expansions needed. This could require additional facilities, services, utilities, and communications, depending on growth in certain testing activities.

Maintenance support of all facilities would continue at present levels. New facilities could be built as required for expansion of activities. Law enforcement, security, fire protection, and health services would expand to match increased activities. Off-site administrative support would be primarily located in Las Vegas, Nevada, and Albuquerque, New Mexico, and their number would increase as needed to serve the Tonopah Test Range.

All utilities would be maintained to ensure they are free of defects. Utilities that are currently not in use might be required to be powered up. Additional support lines could be established. It is anticipated that the present water system would provide sufficient support for an increase in activities, and the present wastewater system would be sufficient to support all growth within Areas 3 and 9. No additional expansion of solid waste units or support construction would be required to support an increase in solid waste. The communication systems described in Section 4.2.1.3 would have the capability of being expanded as needed to support all increased activities at the Tonopah Test Range.

5.3.2.1.2 Airspace—Airspace actions associated with Alternative 3 would most likely be similar to those discussed under Alternative 1. Current levels of air traffic control and navigational air service, as well as airspace structure, would be maintained.

Under this alternative, the only activities that would affect airspace would be defense-related. Therefore, only the Defense and Work for Others Programs are discussed.

Defense Program. Alternative 3 includes all activities identified in Alternative 1 and any increase of defense-related missions not evaluated in the baseline, resulting in more demands on the

airspace by the DOE. This would require additional coordination with the U.S. Air Force to ensure both missions are accommodated.

Work for Others Program. With the Work for Others Program, the continuation of the use of the Tonopah Test Range airspace for various military training exercises and for defense-related activities is anticipated. No commercial air passenger or general aviation activities are anticipated. Occasional air cargo, fixed-wing, and helicopter transit are expected.

Airspace requirements under Alternative 3 would be the same as those currently in effect with Nellis Air Force Base Air Traffic Control Facility, assuming coordination of air traffic control at the Tonopah Test Range and its surrounding areas. The continuation of operations at the Tonopah Test Range under the Work for Others Program under Alternative 3 would require additional coordination with the U.S. Air Force to ensure both missions are accommodated.

5.3.2.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities, as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.3.2.2.1 On-Site Traffic—Traffic volumes on the Tonopah Test Range are below 1,000 vehicles per day on any roadway. Activities associated with the Tonopah Test Range would add minimal traffic to the already underused roadways. Federal agencies that use the Tonopah Test Range would continue to maintain some of the transportation infrastructure.

5.3.2.2.2 Off-Site Traffic—Under Alternative 3, activities at the Tonopah Test Range as a result of the Defense, Environmental Restoration, and Work for Others Programs would generate only an occasional and minor amount of vehicular traffic on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). There would be no traffic impacts on off-site roadways under Alternative 3 .

5.3.2.2.3 Transportation of Materials and Waste—The impacts resulting from the transportation of materials and waste under Alternative 3 would be the same as those described under Alternative 1 in Section 5.1.2.2.3.

5.3.2.2.4 Other Transportation—Under Alternative 3, the impacts related to other transportation would be the same as those described under Alternative 1 in Section 5.1.2.2.4. In addition, the increase in personnel under Alternative 3 might require multiple airplane trips.

5.3.2.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.2.4 Geology and Soils. The impacts to geology and soils resulting from three programs and site-support activities are presented in this section.

Defense Program. Under Alternative 3 for the Tonopah Test Range, the adverse impacts to geologic media discussed under the Defense Program in Section 5.1.2.4 apply. An additional 2.8 acres are anticipated to be impacted by excavation of the surface for installation of infrastructure or test facilities. Weapons tests are anticipated to impact an additional 9 m^2 (100 ft^2) of surface geologic media.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Environmental Restoration Program in Section 5.1.2.4 apply.

Work for Others Program. Under Alternative 3, the adverse impacts to geology and soils are similar to the impacts discussed for the Defense Program under this alternative.

Site-Support Activities. Impacts are not expected as a result of site-support activities.

*5.3.2.5 **Hydrology***. The environmental impacts to surface hydrology and groundwater are described. Discussions of impacts to water quality and water quantity are also presented.

*5.3.2.5.1 **Surface Hydrology***—The impacts to surface hydrology for the programs and site- support activities are presented in this section. One potential impact from all programs would be the alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure.

Some negligible increase in surface water flows may occur if appreciable areas were paved or the natural runoff characteristics were otherwise altered. The impact would not be considered significant.

Defense Program. Adverse impacts to the surface hydrologic environment discussed under the Defense Program in Section 5.1.2.5 apply under Alternative 3 of the Tonopah Test Range. An additional 2.8 acres are anticipated to be impacted by excavation of the surface for installation of infrastructure or test facilities. Weapons tests are anticipated to impact an additional 9 m^2 (100 ft^2) of surface geologic media.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Environmental Restoration Program in Section 5.1.2.5 apply under Alternative 3.

Work for Others Program. Under Alternative 3, Work for Others Program activities are similar to Defense Program activities; therefore, the potential impacts to surface hydrology would be similar.

Site-Support Activities. Site-support activities at the Tonopah Test Range are not expected to significantly impact surface waters.

*5.3.2.5.2 **Groundwater***—For the Tonopah Test Range, the impacts are the same as discussed under Alternative 1. The increase of defense-related activities or acceleration of Environmental Restoration Program activities is not expected to have significant impacts on water demand under Alternative 3.

*5.3.2.6 **Biological Resources***. Only three programs, Defense, Environmental Restoration, and Work for Others, would occur on the Tonopah Test Range under Alternative 3. The discussion for these three programs follows.

Defense Program. The projects under Alternative 3 are similar to those proposed under Alternative 1, except that more tests would be performed in previously disturbed areas. As was concluded for Alternative 1, there would be no impacts on biological resources.

Environmental Restoration Program. The activities under Alternative 3 for this program are similar to those described under Alternative 1 with the exception of the acceleration of scheduled activities associated with this program. This is not likely to change the nature of the impacts as described under Alternative 1.

Work for Others. The activities associated with this program are similar to activities associated with Defense Program activities. Therefore, there would be no impacts to biological resources.

Site-Support Activities. The impacts to biological resources would be the same as those described under Alternative 1 in Section 5.1.2.6.

*5.3.2.7 **Air Quality***. Under Alternative 3, impacts to air quality would be the same as those described under Alternative 1 in Section 5.1.2.7. Increased defense-related programs and the acceleration of the environmental restoration activities would not significantly impact the air quality of the area.

*5.3.2.8 **Noise***. Under Alternative 3, noise impacts would be the same as those described under Alternative 1 in Section 5.1.2.8.

*5.3.2.9 **Visual Resources***. The impacts to visual resources under Alternative 3 would be similar to those described under Alternative 1 in Section 5.1.2.9.

5.3.2.10 Cultural Resources. The impacts to cultural resources on the Tonopah Test Range as a result of activities included under Alternative 3 are presented in this section.

Defense Program. Additional impacts are expected from increased testing, which may result in ground disturbances or a modification of existing structures. Archaeological sites have been recorded in the area, and indirect impacts to these sites could occur as a result of increased visitation to the site.

Environmental Restoration Program. Impacts to cultural resources are the same as those contained in Alternative 1.

Waste Management Program. Under Alternative 3, waste management would expand and additional facilities would be constructed at Areas 3 and 5 at the NTS. An increase in ground disturbances and an increase in visitation could have an impact on cultural resources.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

Defense Program—Under Alternative 3, it is expected that American Indian cultural resources would be adversely impacted if additional underground nuclear tests occur or if new areas are used for expanded testing programs.

Waste Management Program—Under Alternative 3, it is expected that American Indian cultural resources would not be adversely impacted. There is no Waste Management Program on the Tonopah Test Range, and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 3, it is expected that American Indian cultural resources would be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places would be increased if environmental restoration were successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Additional impacts may occur through construction of the Natural Gas Facility.

Work for Others Program. Impacts are the same as contained in Alternative 1.

Site-Support Activities. Impacts are the same as contained in Alternative 1.

Nondefense Research and Development Program—Under Alternative 3, it is expected that American Indian cultural resources would be adversely impacted if natural lands are scraped during any nondefense research and development actions.

Work for Others Program—Under Alternative 3, it is expected that American Indian cultural resources would be impacted if Tonopah Test Range weapons research and development programs were expanded. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.3.2.11 Occupational and Public Health and Safety. Alternative 3 includes all program activities described under Alternative 1 plus additional activities. For Tonopah Test Range workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.3-17 summarizes the occupational and public health and safety impacts for the applicable Tonopah Test Range programs under Alternative 3.

As under Alternative 1, none of the routine activities conducted at the Tonopah Test Range under Alternative 3 involves hazards that would impact public health and safety. Section 5.3.2.7, Air Quality, identifies no active sources for airborne release of radioactivity or criteria pollutants. Section 5.1.2.2.3 addresses the impacts of transportation of radioactive materials and waste. Accidents associated with activities at the Tonopah Test Range could impact public health and safety, and are discussed in this section.

Table 5.3-17. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.6	0.0046	0.0028	0.0011	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-8}	1×10^{-07}	9.6×10^{-7}
Environmental Restoration	0.0054	0.0011	2.6×10^{-4}	1.4×10^{-4}	e	e	1.2×10^{-9}	5.7×10^{-10}	e	e
Total	**2.6**	**0.0057**	**0.0031**	**0.0012**	**8.4×10^{-12}**	**1.8×10^{-5}**	**1×10^{-8}**	**4.7×10^{-8}**	**1×10^{-09}**	**9.6×10^{-7}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.

Defense Program. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.6 injuries and 0.0046 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same time period, no injuries or fatalities are projected as a result of routine program activities. Based on previous occupational radiation records, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 7-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0028 latent cancer fatalities and 0.0011 other detrimental health effects in the worker population. The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect.

The health and safety impact to the public from potential Defense Program accidents at Tonopah Test Range could result in about 9.0×10^{-9} latent cancer fatalities and 4.1×10^{-9} other detrimental health effects in the population. Additional risk due to accidental exposure to hazardous chemicals would be even less.

The maximum reasonably foreseeable Defense Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} [1 in 10,000,000] per year).

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.2.11 for Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} [1 in 170,000] per year).

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, the Environmental Restoration Program is expected to result in 0.0054 injuries and 0.0011 fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Tonopah Test Range Environmental Restoration Program workers of about 0.7-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 2.6×10^{-4} latent cancer fatalities and 1.2×10^{-4} other detrimental health effects in the worker population. The risk of accidental exposure to radioactive releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect. No Environmental Restoration Program hazardous chemical accident resulting in measurable effects at the Tonopah Test Range has been identified.

The health and safety impact to the public from potential Environmental Restoration Program accidents at Tonopah Test Range could result in about 1.2×10^{-9} latent cancer fatalities and 5.7×10^{-10} other detrimental health effects in the population.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1×10^{-6} [1 in 1,000,000] per year).

5.3.2.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.2.10, Cultural Resources, and 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past,

present, and future activities on the Tonopah Test Range have, are or will disproportionately impact the American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.3.3 Project Shoal Area

The Environmental Restoration Program is the only program scheduled for the Project Shoal Area under this alternative; therefore, it is the only program discussed. Characterization and remediation activities would continue as in Alternative 1 with the possibility of accelerated schedules.

5.3.3.1 Land Use. The completion of the actions on an accelerated schedule would not appreciably decrease the time required for any given activity. Site characterization or feasibility studies action would be initiated sooner under this alternative. No impacts to land use are expected. Because of the remoteness of this site and the compatible surrounding land uses, no impacts are anticipated to surrounding land uses.

5.3.3.1.1 Site-Support Activities—No significant impacts on site-support activities would occur as a result of Alternative 3 actions. Requirements for water, power, and other facilities would not be increased from Alternative 1 levels.

5.3.3.1.2 Airspace—Under Alternative 3, the Environmental Restoration Program activities anticipated at the Project Shoal Area would not use air transportation. Therefore, there would be minimal effects on airspace at the Project Shoal Area as a result of this alternative.

5.3.3.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.3.3.2.1 On-Site Traffic—Environmental Restoration Program activities at the Project Shoal Area would be short-term and would require relatively few personnel (less than 10 people at any given time). Therefore, no traffic impacts are expected.

5.3.3.2.2 Off-Site Traffic—Under Alternative 3, Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). Therefore, under Alternative 3, there would be no traffic impacts on off-site roadways.

5.3.3.2.3 Transportation of Materials and Waste—The transport of materials and wastes from the Project Shoal Area would not have a significant impact on the overall risk estimates; chances for getting cancer or having radiation detriment from these shipments would be highly unlikely.

5.3.3.2.4 Other Transportation—Because Alternative 3 activities would not include direct use of local railroads or other modes of air transportation to the Project Shoal Area, direct effects on rail and other modes of transportation are expected to be minimal. Furthermore, the anticipated activities at the site do not call for a measurable transportation demand.

5.3.3.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.3.4 Geology and Soils. Under Alternative 3, the impacts to geology and soils would be the same as those described under Alternative 1 in Section 5.1.3.4. Acceleration of the restoration schedule would not significantly impact geology and soils.

5.3.3.5 Hydrology. Actual water demand on an accelerated schedule would not vary appreciably from Alternative 1, in which only minimal quantities of water would be required.

5.3.3.6 Biological Resources. The activities at this site would be similar to those described under Alternative 1, so the impacts would be the same as those described under Alternative 1.

5.3.3.7 Air Quality. Emissions from the operation of U.S. Navy aircraft over the Project Shoal Area would have little impact on surface ambient pollutant concentrations. Studies have shown that resulting concentrations would be about 0.05 percent of allowable concentrations (SAIC/DRI, 1991). About 10 acres of land would be disturbed during the Environmental Restoration Program. The average annual fugitive dust emission (PM_{10}) from Alternative 3 drilling activity would be about 3 tons. Fugitive dust calculations assume a 50-percent reduction as a result of watering the sites. Because activities are only expected to occur on a short-term basis, long-term air quality impacts are not expected.

5.3.3.8 Noise. Under Alternative 3, noise impacts would be the same as those described under Alternative 1 in Section 5.1.3.8.

5.3.3.9 Visual Resources. Impacts to visual resources under Alternative 3 would be similar to those described under Alternative 1 in Section 5.1.3.9.

5.3.3.10 Cultural Resources. Indirect impacts to cultural resources might result from increased visitation and vehicular traffic in archaeologically sensitive areas. The indirect impacts would be monitored through site visits by archaeologists.

AMERICAN INDIAN CULTURAL RESOURCES— This section describes the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

This study is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal test site area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

Note: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.3.3.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Project Shoal Area under Alternative 3. No contamination has been detected in surficial soils at this site, and no surface soil remedial actions are proposed. Activities at this site would consist of characterization and hydrologic monitoring. Alternative 3 accelerates the program activities described under Alternative 1. For Project Shoal Area workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.3-18 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 3. As in Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 3. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed under Alternative 1 in Section 5.1.3.11.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Project Shoal Area are expected to result in 1.7×10^{-4} injuries and 3.4×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Project Shoal Area Environmental Restoration Program workers of about 0.05-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could

Table 5.3-18. Health risks to workers and the public from program activities, Project Shoal Area, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.7×10^{-4}	3.4×10^{-5}	1.9×10^{-5}	7.6×10^{-6}	c	c	d	d	c	c
Total	$\mathbf{1.7 \times 10^{-4}}$	$\mathbf{3.4 \times 10^{-5}}$	$\mathbf{1.9 \times 10^{-5}}$	$\mathbf{7.6 \times 10^{-6}}$	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

result in about 1.9×10^{-5} latent cancer fatalities and 7.6×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area have been identified.

5.3.3.12 Environmental Justice. Impacts for Environmental Justice at this site are discussed for the region of influence in Section 5.3.1.12. *American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3)cultural survival especially access violations. The impacts are discussed in Section 5.3.8.10, Cultural Resources, and 5.3.1.11, Occupational and Public Health and Safety. There has been no systematic study of these issues for the Project Shoal Area.*

The study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes

5.3.4 Central Nevada Test Area

The Environmental Restoration Program is the only program planned for the Central Nevada Test Area under this alternative; therefore, it is the only program discussed. Characterization and remediation activities would continue, but might be accelerated relative to Alternative 1.

5.3.4.1 Land Use. Under Alternative 3, the actions taken at the Central Nevada Test Area are the same as under Alternative 1, but on an accelerated schedule. An accelerated schedule would not appreciably decrease the time required for any given activity; e.g., site characterization or feasibility studies. The actions simply would be initiated sooner under this alternative. No land-use impacts are expected because of the remoteness of the Central Nevada Test Area and similar land use surrounding it. Fallon Naval Air Station intends to create military operating areas in three of Nye County's rural regions; they would be designated Smoky, Duckwater, and Diamond. The Central Nevada Test Area falls under the Duckwater military operating area.

This airspace expansion has not yet been filed and would not affect Environmental Restoration Program activities at the Central Nevada Test Area. Therefore, there would be minimal effects on airspace at the Central Nevada Test Area as a result of Alternative 3. No other programs are scheduled at the Central Nevada Test Area.

5.3.4.2 Transportation. The following sections address the discussion of the environmental impacts related to transportation activities as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.3.4.2.1 On-Site Traffic—Environmental Restoration Program activities at the Central Nevada Test Area would be short-term and would require relatively few personnel (less than 10 at any given time). There are no public roads currently on site, and the low level of personnel anticipated would generate a minor amount of traffic.

5.3.4.2.2 Off-Site Traffic—Under Alternative 3, Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day). Therefore, under Alternative 3, there would be minor vehicular traffic generated and no traffic impacts on off-site roadways.

5.3.4.2.3 Transportation of Materials and Waste—The transport of radioactive waste from the Central Nevada Test Area would not have a significant impact on the overall risk estimates; that is, the chances of getting cancer or having radiation detriment from these shipments is highly unlikely.

5.3.4.2.4 Other Transportation—Because Alternative 3 activities do not include direct use of local railroads, air transportation, or other modes of transportation to this site, direct effects on rail, air, and other modes of transportation are expected to be minimal.

5.3.4.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of

influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.4.4 Geology and Soils. Potential impacts to the geology of the Central Nevada Test Area are the same as described for Alternative 1 in Section 5.1.4.4.

5.3.4.5 Hydrology. Under Alternative 3, the Environmental Restoration Program actions would be accelerated. Water demand on an accelerated schedule would not vary appreciably from Alternative 1, in which only minimal quantities of water would be required.

5.3.4.6 Biological Resources. The activities at this site under Alternative 3 are similar to those described under Alternative 1. Therefore, the impacts are the same as those described under Alternative 1 in Section 5.1.4.6.

5.3.4.7 Air Quality. Under Alternative 3, air quality impacts at the Central Nevada Test Area would be the same as those described for Alternative 1 in Section 5.1.4.7.

5.3.4.8 Noise. Noise impacts as a result of Alternative 3 would be the same as those described for Alternative 1 in Section 5.1.4.8.

5.3.4.9 Visual Resources. Under Alternative 3, the impacts to visual resources would be similar to those described for Alternative 1 in Section 5.1.4.9.

5.3.4.10 Cultural Resources. Under Alternative 3, impacts to cultural resources on the Central Nevada Test Area would be identical to those defined for Alternative 1 in Section 5.1.4.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

Defense Program—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if nuclear tests continue or increase and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program—Under Alternative 3, it is expected that American Indian cultural resources will not be adversely impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 3, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during weapons research and development. No such actions are planned for this alternative, so cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs are implemented in the Central Nevada Test Area. No such actions are planned for this alternative, so American Indian cultural resources will not be adversely impacted.

5.3.4.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Central Nevada Test Area under Alternative 3. Activities at this site would consist of site characterization and remediation with removal of contaminated mud and sludge. Alternative 3 accelerates the program activities described under Alternative 1. For Central Nevada Test Area workers, the increased activities are expected to result in a corresponding

increase in human health and safety impacts compared to Alternative 1. Table 5.3-19 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 3. As under Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 3. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed for Alternative 1 in Section 5.1.4.11

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Central Nevada Test Area are expected to result in 1.7×10^{-4} injuries and 3.4×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Central Nevada Test Area Environmental Restoration Program workers of about 0.05-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.9×10^{-5} latent cancer fatalities and 7.6×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Central Nevada Test Area have been identified.

5.3.4.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence under Alternative 1 in Section 5.3.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.4.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present, and future activities on the Central Nevada Test Area have, are, or will impact these American Indian Environmental Justice issues. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undue past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved. Program-by-program responses are assessed in Section 5.1.1.12.

5.3.5 Eldorado Valley

A Solar Enterprise Zone facility would be developed as part of the Nondefense Research and Development Program under Alternative 3. The only activity being considered for Eldorado Valley is the Solar Enterprise Zone facility. Therefore, it is the only program discussed for this site. A sitewide environmental impact statement, supplemental environmental impact statement, and/or other environmental analysis would be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker transition training development and implementation would also be accomplished.

According to the Nevada Solar Enterprise Zone Task Force Work Group (DOE/NV, 1994c), a reinforcement of the natural gas supply system could be required. Water supplies would also have to be secured for the site, and conveyance systems would have to be installed.

Construction of a 19-km (12-mi) water line from Boulder City and a 10-km (6-mi) natural gas line are necessary to support the alternative energy project at this site.

5.3.5.1 Land Use. The location of the Solar Enterprise Zone facility at the Eldorado Valley would not result in significant impacts on land use.

Table 5.3-19. Health risks to workers and the public from program activities, Central Nevada Test Area, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.7×10^{-4}	3.4×10^{-5}	1.9×10^{-5}	7.6×10^{-6}	c	c	d	d	c	c
Total	**1.7×10^{-4}**	**3.4×10^{-5}**	**1.9×10^{-5}**	**7.6×10^{-6}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

Designation of the site for renewable energy development would be consistent with surrounding land uses, such as a tortoise preserve.

This site falls within the Las Vegas terminal control area. A Solar Enterprise Zone facility at this site would not be expected to affect aircraft operations in the vicinity of McCarran International Airport. However, the construction of the Dish/Stirling solar trough and other facilities (energy corridors) would need to be coordinated with airport management and the Federal Aviation Administration to ensure obstacle clearance criteria and safety; e.g., the elimination of possible glare from dishes.

5.3.5.2 ***Transportation.*** The analysis of transportation impacts is presented with respect to on-site and off-site traffic.

5.3.5.2.1 ***On-Site Traffic***—Assuming that employees commute daily to work by private passenger cars (not buses), there would be 1,060 daily vehicle trips generated, based on the rate 3.02 daily vehicle trip ends per employee (ITE, 1991) and 0.44 vehicle trip ends per employee during peak hours. During peak hours, the project would generate 150 vehicle trips in both directions or 120 trips in the peak direction. This would not affect on-site traffic appreciably.

5.3.5.2.2 ***Off-Site Traffic***—U.S. Highway 95 would be the major regional access to the site; U.S. Highway 95 is a two-lane, two-way rural highway south of Boulder City with 6,600 average daily traffic in 1993. The projected peak-hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.3-4. With the Solar Enterprise Project, U.S. Highway 95 near the site would continue to operate at level of service C.

5.3.5.3 ***Socioeconomics.*** The socioeconomic analysis has been prepared for the region of influence regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.5.4 ***Geology and Soils.*** There would be some impacts on the geologic resources and soils of Eldorado Valley as a result of the development of a Solar Enterprise Zone facility. An extensive area of soils would be disturbed and, if blasting is required, some minor ground motion might be induced. Aggregate would be required for roads and concrete; however, the aggregate resources of the region are very large, and the use of aggregate for a Solar Enterprise Zone facility would not result in a significant loss of resources.

5.3.5.5 ***Hydrology.*** The impact of a Solar Enterprise Zone facility on the hydrology and water resources of Eldorado Valley would depend on the source of the water. It is anticipated that the water requirements would be met through the purchase of water directly from Boulder City and the city of Henderson. The purchase and use of this water would increase the total use of Colorado River water in southern Nevada, but by a very small percentage. The application of this water to a Solar Enterprise Zone facility would represent an opportunity for gain or loss depending on other potential uses for the water.

The perennial yield of Eldorado Valley is only 6.2×10^5 m³/yr (500 acre-feet per year), and the basin is already overdrafted. Groundwater withdrawals for support of a Solar Enterprise Zone facility would result in additional overdrafting and would result in a continual lowering of water levels in the vicinity of water supply wells.

If groundwater withdrawals from the basin are permitted and used, then the effects on water levels in the basin would be significant. Assuming a 40-year project peak, water demand and aquifer transmissivity of 189,265 L/day (50,000 gal/day) per foot and the conservative assumptions behind this non-equilibrium equation (Driscoll, 1986), the drawdown in water levels for a Solar Enterprise Zone facility can be predicted. The estimated drawdown for this scenario is appreciable, 31 m (100 ft) in the immediate vicinity of the pumping well field and as much as 9 m (30 ft) at a distance of 6 km (4 mi) from the well field.

5.3.5.6 ***Biological Resources.*** A Solar Enterprise Zone facility would involve the development of up to four technologies or subprojects capable of generating electricity from solar energy. For this analysis, it was assumed that one of the four technologies would be developed, and about 2,400

acres of previously undisturbed habitat would be cleared for the site, and 420 acres for utility corridors. Loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects should not have a negative impact on the viability of most species found in this area. The species are common throughout a large, relatively undisturbed region. No threatened, endangered, or candidate plants or animals are known to occur in the proposed area; however, this area has not been thoroughly surveyed. If populations of rare species are found, this project might impact their viability. Nests of birds, protected under the Migratory Bird Treaty Act, may be destroyed if ground clearing for construction of the project occurred during the breeding season. The abundance of desert tortoises is low in the vicinity of the proposed site (U.S. Fish and Wildlife Service, 1994), and the site is not critical habitat for this species. Tortoises living within the site could be killed, injured, or displaced during construction of the facility. Tortoises are also likely to be killed on roads during transportation activities for this project.

Construction of water and natural gas lines could significantly impact populations of rare species or the threatened desert tortoises. However, the locations of these support facilities have not been finalized, and the impacts, therefore, cannot be accurately evaluated.

5.3.5.7 Air Quality. Construction of a 100-MW solar-generated electric power station at Eldorado Valley would generate fugitive dust (PM_{10}) emissions during ground-disturbing activities. In addition, mobile source emissions would be generated by construction employee vehicles.

About 2,400 acres of land would be disturbed during a two-year period. The average annual fugitive dust (PM_{10}) emission from this activity would be about 360 tons. Fugitive dust generated from construction of the solar-powered electric power plant would be minor.

Mobile-source emissions would consist of exhaust emissions from vehicles used by construction employees to commute to and from the site. Assuming about 350 vehicles per day would travel to the site, pollutant emissions would be as follows:

- Volatile Organic Compounds: 10.57 tons/yr
- Carbon Monoxide: 71.66 tons/yr
- Nitrogen Oxides: 15.74 tons/yr

These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations sufficiently outside the Las Vegas Valley to cause any violations of the Ambient Air Quality Standards. Eldorado Valley is outside of the Las Vegas Valley, which is classified as a nonattainment area for carbon monoxide. However, emissions from vehicles driven by construction employees generated in the Las Vegas area may contribute to this area continuing to be classified as nonattainment for carbon monoxide.

5.3.5.8 Noise. Noise generation related to the construction of a Solar Enterprise Zone facility technology equipment would occur under Alternative 3. Temporary impacts resulting from construction-related noise would occur within the immediate vicinity of the construction sites. Noise impacts would be negligible. The site is located within a remote area, and no sensitive receptors are close to the construction area. Potential construction-related noise levels of 80 to 85 dBA at 15 m (50 ft) from construction equipment (e.g., large trucks and front-end loaders) would be reduced as distance increases. Because activities are only expected to occur on a short-term basis, long-term noise impacts are not expected.

5.3.5.9 Visual Resources. A Solar Enterprise Zone facility proposed for the Eldorado Valley site would disturb approximately 2,400 acres, representing about 40 percent of the site. The landscape of Eldorado Valley is common to the region. However, the site has a high visual sensitivity level because it is crossed by U.S. Highway 95. There are also three U.S. Bureau Land Management wilderness study areas within the site's viewshed. Because of the size of the area affected and the visibility from U.S. Highway 95, there would be adverse visual impacts.

5.3.5.10 Cultural Resources. The construction of a Solar Enterprise Zone facility and the expansion of existing facilities is likely to impact both previously recorded and undiscovered cultural resources in Eldorado Valley. Indirect impacts

might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with the potential development of a Solar Enterprise Zone facility in the Eldorado Valley.

It is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 3.

5.3.5.11 Occupational and Public Health and Safety. Health and safety issues at a Solar Enterprise Zone facility site would be related to construction activities and are not expected to be out of the ordinary; therefore, impacts would be minimal.

5.3.5.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.5.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have impacted these American Indian issues, especially Holy Land violations. This constitutes a disproportionate impact on American Indian People. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.3.6 Dry Lake Valley

A Solar Enterprise Zone facility would be developed as part of the Nondefense Research and Development Program under Alternative 3. The only activity being considered for Dry Lake Valley is the location of a Solar Enterprise Zone facility. Therefore, Nondefense Research and Development is the only program discussed. A sitewide environmental impact statement, supplemental environmental impact statement, and/or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

Three important support activities must be completed before a Solar Enterprise Zone facility could be constructed at this site. A 2-km (1-mi) natural gas pipe line would need to be constructed to allow connection to the Kern River pipe line. A 48-km (30-mi) power line would need to be constructed for a solar energy generating facility. Water would have to be pumped to this site, perhaps from Moapa Valley.

5.3.6.1 Land Use. The location of a Solar Enterprise Zone facility at the Dry Lake Valley would not result in significant impacts on land uses. The designation of the site for renewable energy development is consistent with surrounding land uses, which include an industrial park, the municipal landfill, a co-generation facility, and, to the northeast of California Wash, The Reid Gardner Power Station, a coal-fired power plant.

This site falls within the NAFR Complex and the Las Vegas terminal control area. A Solar Enterprise Zone facility at this site would not be expected to affect aircraft operations. The construction of the Dish/Stirling solar trough and other facilities (energy corridors) would need to be coordinated with the Federal Aviation Administration and airport management to ensure obstacle clearance criteria and safety; e.g. avoidance of conflicting glare from dishes.

5.3.6.2 Transportation. The analysis of transportation impacts is presented with respect to on-site and off-site traffic.

5.3.6.2.1 On-Site Traffic—Assuming that employees commute daily to work by private passenger cars (not buses), there would be 1,060

daily vehicle trips generated, based on the rate of 3.02 daily vehicle trip end per employee (ITE, 1991) and 0.44 vehicle trip end per employee during peak hours. During peak hours, the project would generate 150 vehicle trips in both directions or 120 trips in the peak direction. This on-site traffic would have very little impact on the site.

5.3.6.2.2 Off-Site Traffic—Interstate 15 would be the major regional access to the site; Interstate 15 is a four-lane divided freeway with 12,906 average daily traffic in 1993 south of the Lamb Boulevard intersection. The projected peak-hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.3-4. With a Solar Enterprise Zone facility, U.S. Highway 93 near the site would continue to operate at level of service B or better.

5.3.6.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included under Section 5.3.1.3.

5.3.6.4 Geology and Soils. There would be some impacts on the geologic resources and soils of Dry Lake Valley as a result of the development of a Solar Enterprise Zone facility. An extensive area of soils would be disturbed and, if blasting is required, some minor ground motion might be induced. Aggregate would be required for roads and concrete. However, the aggregate resources of the region are very large, and the use of aggregate for a Solar Enterprise Zone facility would not result in a significant loss of resources.

5.3.6.5 Hydrology. The lack of a water supply for the construction and operation of a Solar Enterprise Zone facility is a serious limitation in Dry Lake Valley. The perennial yield of the basin is only 4.9×10^5 m³/yr (400 acre-feet per year). There are 1.1×10^6 m³/yr (930 acre-feet per year) of existing water rights, and more applications for water rights have been made totaling more than 2.6×10^7 m³/yr (21,000 acre-feet per year). It is unlikely that water rights could be secured within the basin unless the use of water for a Solar Enterprise Zone facility is designated as a preferred use. In this event, the impacts of pumping would be similar to those described for the Eldorado Valley location (i.e., water level declines as much as 31 m [100 ft] in the vicinity of the operating well field and as much as 9 m [30 ft] at a distance of 6 km [4 mi] from the well field). Most likely, outflow to the California Wash would be slightly reduced, but, because of the low volume of such a reduction and the poor quality of that discharge, the impact to downgradient basins would be minimal.

If the proposed facility is not designated as a preferred use, then it is not likely that the large-scale water withdrawals needed for a Solar Enterprise Zone facility would be permitted. In this case, a source of water for the construction and operation of a Solar Enterprise Zone facility would have to be located beyond the basin boundaries.

Alternate locations for the development of a water supply are limited. The groundwater basins in the vicinity of Dry Lake Valley are either already designated as critical groundwater basins, do not have adequate groundwater resources to support such a project, or have numerous outstanding water right applications. Pending the identification of a source of water for the proposed location in Dry Lake Valley, no analyses can be performed to predict the effects on the basin from which the water is obtained.

5.3.6.6 Biological Resources. It is assumed that about 2,400 acres of previously undisturbed habitat would be cleared for the site, and 560 acres for utility corridors. This loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects would not have a negative impact on the viability of most species found in this area. The species are common throughout a large, relatively undisturbed region. A survey of the site to be disturbed has not been conducted; therefore, it is not possible to determine if any rare species would be affected. Nests of birds, protected under the Migratory Bird Treaty Act, may be destroyed if ground clearing for construction of the project occurred during the breeding season.

However, two State-protected plant species are found in this valley. If the facility causes the destruction of a population of one of these or any other rare species, the viability of that species might be significantly affected. Desert tortoises are found

throughout this valley, but their densities are generally low (Clark County, 1990). This site is not critical habitat for desert tortoises. Tortoises living within the site might be killed, injured, or displaced during construction of the facility. Some tortoises could be killed on roads during transportation activities for this project.

Construction of site-support facilities, such as a water line and a natural gas pipe line, might significantly impact populations of rare species or the threatened desert tortoises.

Water sources for a Solar Enterprise Zone facility are not currently known. Given the limited water availability in this and surrounding valleys (see Section 5.3.6.5), water use may have negative impacts on springs and their associated biota, including some threatened or endangered species.

5.3.6.7 Air Quality. Construction of a Solar Enterprise Zone facility at Dry Lake Valley would generate fugitive dust (PM_{10}) emissions during ground-disturbing activities. In addition, mobile-source emissions would be generated by construction employee vehicles.

About 2,400 acres of land would be disturbed during a two-year period. The average annual fugitive dust (PM_{10}) emission from this activity would be about 360 tons. Fugitive dust generated from construction of a solar-electric power plant would be minor.

Mobile-source emissions would consist of exhaust emissions from vehicles used by construction employees to commute to and from the site. Assuming about 350 vehicles per day would travel to the site, pollutant emissions would be as follows:

- Volatile Organic Compounds: 6.61 tons/yr
- Carbon Monoxide: 44.79 tons/yr
- Nitrogen oxides: 9.84 tons/yr

These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations sufficiently outside the Las Vegas Valley to cause any violations of the Ambient Air Quality Standards. The Dry Lake Valley is outside of the Las Vegas Valley, which is classified as a nonattainment area for carbon monoxide. However, emissions from vehicles driven by construction employees generated in the Las Vegas area may contribute to this area continuing to be classified as nonattainment for carbon monoxide.

5.3.6.8 Noise. Noise impacts in Dry Lake Valley as a result of siting a Solar Enterprise Zone facility would be the same as those described for Eldorado Valley in Section 5.3.5.8.

5.3.6.9 Visual Resources. The landscape of Dry Lake Valley is common to the region and is near an industrial development. The Nevada Power Company is planning to develop four additional power plants at this site, which already contains electrical power equipment. The site has a high visual sensitivity level because it is near Interstate 15. Construction of a Solar Enterprise Zone facility at this site would result in adverse impacts; however, the degree of contrast would be moderate because of the extensive man-made modifications already existing in the areas.

5.3.6.10 Cultural Resources. The construction of a Solar Enterprise Zone facility and the expansion of existing facilities would likely impact both previously recorded and undiscovered cultural resources in Dry Lake Valley. In particular, those sites associated with shoreline adaptations and the historically important Spanish Trail/Mormon Road might be affected. The precise nature of these impacts is unknown. However, any project that involves ground disturbance or modification to existing structures or features is likely to impact resources. Indirect impacts might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with the development of a Solar Enterprise Zone facility, as summarized by the CGTO.

It is expected that American Indian cultural resources will be adversely impacted if a Solar Enterprise Zone facility is constructed and operated.

5.3.6.11 Occupational and Public Health and Safety. Occupational and public health and safety issues at this site would be related to construction

activities. Therefore, impacts are expected to be minimal.

5.3.6.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian Environmental Justice include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.6.10, Cultural Resources, and 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Dry Lake Valley, The CGTO maintains that past activities in the Dry Lake Valley have disproportionately impacted American Indian people, especially, Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in 5.1.1.12 and are not repeated here.

5.3.7 Coyote Spring Valley

A Solar Enterprise Zone facility would be developed as part of the Nondefense Research and Development Program under Alternative 3. Because this is the only alternative being considered for Coyote Spring Valley, Nondefense Research and Development is the only program discussed for this site. A sitewide EIS, supplemental environmental EIS, and/or other environmental studies would be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker transition training development and implementation would also be accomplished.

To maintain continuous power production, an 85 km (53-mi) natural gas pipe line would have to be constructed to tie into the Kern River pipe line. Development of any but the smallest subprojects would require upgrading of the power line system to this site. Water availability remains an unsettled issue, thus the size and location of water pipe line corridors are currently unknown.

5.3.7.1 Land Use. Alternative 3 actions would not significantly impact land uses. Surrounding land uses include wildlife management, mining, and recreation.

The Coyote Spring Valley falls within the NAFR Complex and the Las Vegas terminal control area. A Solar Enterprise Zone facility at this site would not be expected to affect aircraft operations. However, the construction of the Dish/Stirling solar trough and other facilities (energy corridors) would need to be coordinated with the Federal Aviation Administration and airport management to ensure obstacle clearance criteria and safety; e.g., elimination of possible glare from dishes.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.7.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of the issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have disproportionately impacted the American Indian people, especially regarding Holy Land violations. This area was traditional lands for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in 5.1.1.12 and are not repeated here.

5.3.7.2 Transportation. The analysis of transportation impacts is presented with respect to on-site and off-site traffic.

5.3.7.2.1 On-Site Traffic—Assuming that employees commute daily to work by private passenger cars (not buses), there would be 1,060 daily vehicle trips generated, based on the rate of

3.02 daily vehicle trip ends per employee (ITE, 1991) and 0.44 vehicle trip ends per employee during peak hours. During the peak hours, the project would generate 150 vehicle trips in both directions or 120 trips in the peak direction. These trips would not significantly impact the site.

5.3.7.2.2 Off-Site Traffic—U.S. Highway 93 would be the major regional access to the site; U.S. Highway 93 is a two-lane, two-way rural highway with 1,210 average daily traffic in 1993 south of State Route 375 Junction. The projected peak-hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.3-4. With a Solar Enterprise Zone Project, U.S. Highway 93 near the site would continue to operate at level of service C or better.

5.3.7.3 Socioeconomics. One of the objectives of a Solar Enterprise Zone facility in Coyote Spring Valley is to provide local employment and economic benefits to offset the impact of defense conversion on the NTS. A Solar Enterprise Zone facility would stimulate the economy of Coyote Spring Valley and Lincoln County, while simultaneously serving national energy and environmental objectives. Building individual solar projects would provide construction jobs for a short period of time, while a fairly small, stable workforce would be required for sustained operation and maintenance of the facilities.

Solar energy could help meet the increased demand for electricity without damaging the environment. The development of a new science and manufacturing base mission is important. At the same time, environmental concerns create a growing demand for alternative generating technologies.

The socioeconomic impacts of a Solar Enterprise Zone facility will be presented when more information with respect to economic activity, population, housing, public finance, and public services is available. A sitewide EIS, supplemental EIS, and/or other environmental studies will be performed to describe all socioeconomic impacts. In addition, project plans, site preparation, technical studies, and worker transition training development and implementation would be accomplished.

5.3.7.4 Geology and Soils. There would be some impacts on the geologic resources and soils of Coyote Spring Valley as a result of the development of a Solar Enterprise Zone facility. An extensive area of soils would be disturbed, and, if blasting is required, some minor ground motion might be induced. Aggregate would be required for roads and concrete. However, the aggregate resources of the region are very large, and the use of aggregate for a Solar Enterprise Zone facility would not result in a significant loss of resources. If the Coyote Spring Valley site is selected for a Solar Enterprise Zone facility, a site-specific environmental document would be prepared that covers the impacts of construction and operation of the facility.

5.3.7.5 Hydrology. Although the water resources of Coyote Spring Valley are appreciable, they have been the focus of some of the largest water right filings ever made in the state of Nevada. The perennial yield of the basin is large (2.2×10^7 m³/yr [18,000 acre-feet per year]); however, almost all of this quantity is based on the assumption that half the underflow that discharges out of the basin could be captured and placed to a beneficial use within Coyote Spring Valley.

Even though the current groundwater use in Coyote Spring Valley is minimal, there have been many applications to appropriate groundwater within the basin. Applications that have been filed total 5.2 m³/yr (185 ft³/sec) or 1.7×10^8 m³/yr (133,940 acre-feet per year). Obviously, only a small portion, if any, of these water right applications will ever be granted. Unless the use of water for a Solar Enterprise Zone facility is designated as a preferred use, there would be little chance that groundwater might be appropriated in Coyote Spring Valley for its construction and operation.

The impacts of the water withdrawals from the carbonate aquifer in Coyote Spring Valley may be estimated on the basis of prior tests conducted by the U.S. Air Force. The U.S. Air Force conducted numerous well and aquifer tests, including a 30-day test at 12,870 L/min (3,400 gal/min), the same peak amount that might be required for a Solar Enterprise Zone facility. During testing, water levels were measured in adjacent monitoring wells in the downgradient basin and spring discharge rates at the

Muddy Springs area. No declines in water levels or spring discharge rates could be detected that were attributed to the testing of the carbonate well.

Thus, significant impacts from the pumping of this well at equal or lower rates for the Solar Enterprise Zone facility would not be likely. A localized lowering of water levels would occur in the vicinity of the pumping well, but, based on testing results, would be less than 6 m (20 ft) at the well and less than 1.5 m (5 ft) at a distance of 100 m (330 ft) after 20 years of continuous pumping. These impacts are not considered significant.

5.3.7.6 Biological Resources. It is assumed that about 2,400 acres of previously undisturbed habitat would be cleared for the site, and 960 acres for utility corridors. This loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects should not have a negative impact on the viability of most species found in this area. The species are common throughout a large region. However, because a survey of the proposed site has not been conducted, it is not possible to determine if rare species will be affected. Nests of birds, protected under the Migratory Bird Treaty Act, may be destroyed if ground clearing for construction of the project occurred during the breeding season.

This valley generally has a low-to-moderate density of desert tortoises, but some areas in this valley have moderately high-to-high densities (Garcia et al., 1982). Tortoises living within the project site may be killed, injured, or displaced during construction of the facility. Tortoises also are likely to be killed on roads during transportation activities for this project. Because the abundance of desert tortoises is higher in Coyote Spring Valley than in the other sites considered for a Solar Enterprise Zone facility, and because this site is within critical habitat for desert tortoises, development of the project at this site would likely have a greater negative impact on desert tortoises than development elsewhere. Because of the presence of critical habitat, final siting discussions should be strongly influenced by potential impacts on biological resources.

It is proposed that 6.8 x 10^6 m^3 (5,500 acre/ft) of groundwater be pumped from Coyote Spring Valley. This groundwater withdrawal is not expected to influence water quality or quantity in nearby springs (see Section 5.3.7.5) and thus should have no biological impacts.

Construction of these infrastructure support facilities could significantly impact populations of rare species or the threatened desert tortoises.

5.3.7.7 Air Quality. Construction of a Solar Enterprise Zone facility in Coyote Spring Valley would generate fugitive dust (PM_{10}) emissions during ground-disturbing emissions. In addition, mobile-source emissions would be generated by construction employee vehicles.

About 2,400 acres of land would be disturbed during a two-year period. The average annual fugitive dust (PM_{10}) emission from this activity would be about 360 tons. Mobile-source emissions would consist of exhaust emissions from vehicles used by construction employees to commute to and from the site. Assuming about 350 vehicles per day would travel to the site, pollutant emissions would be as follows:

- Volatile Organic Compounds: 13.21 ton/yr
- Carbon Monoxide: 89.58 ton/yr
- Nitrogen Oxides: 19.67 ton/yr

These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations sufficiently to cause any violations of the Ambient Air Quality Standards. Coyote Spring Valley is outside of the Las Vegas Valley, which is classified as a nonattainment area for carbon monoxide. However, emissions from vehicles driven by construction employees generated in the Las Vegas area may contribute to this area continuing to be classified as nonattainment for carbon monoxide.

5.3.7.8 Noise. Noise impacts at Coyote Spring Valley would be the same as those described for Eldorado Valley in Section 5.3.5.8.

5.3.7.9 Visual Resources. The visual quality of Coyote Spring Valley has been designated as Class B because of the extensive panoramic views of the surrounding mountain ranges. In addition, the Solar Enterprise Zone facility site has high visual

sensitivity because it is visible from the west on U.S. Highway 93. There are also three U.S. Bureau of Land Management Wilderness Study Areas within the site's viewshed. Construction of a Solar Enterprise Zone facility would greatly change the landscape character of Coyote Spring Valley, adversely impacting visual resources.

5.3.7.10 Cultural Resources. The construction of a Solar Enterprise Zone facility is likely to impact both previously recorded and undiscovered cultural resources in Coyote Spring Valley. Indirect impacts might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES— This section describes the American Indian concerns associated with the development of a Solar Enterprise Zone facility in Coyote Spring Valley, as summarized by the CGTO.

It is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a Solar Enterprise Zone facility is constructed and operated.

5.3.7.11 Occupational and Public Health and Safety. Health and safety impacts at this site are expected to be minor. The health and safety issues are related to construction activities that are expected to be typical.

5.3.7.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.7.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have disproportionately impacted the American Indian people, especially regarding Holy Land violations. This area was traditional lands for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these land for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.4 Alternative 4 - Alternate Use of Withdrawn Lands

Under Alternative 4, Alternate Use of Withdrawn Lands, all defense-related activities and most Work for Others Program activities at the NTS would be discontinued. A possible exception would be the allowance for an increased use of airspace by the U.S. Air Force. The primary activities anticipated under this alternative would be the continuation of waste management operations in support of NTS environmental restoration and waste-generating activities associated with projects sited at the NTS under this alternative. This alternative includes programs at the NTS, the NAFR Complex, the Project Shoal Area, the Central Nevada Test Area, and the three Solar Enterprise Zone locations: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley, as well as the release of approximately 526 km^2 (203 mi^2) of lands currently within the NTS for public education and recreation. This section contains the summary of activities that are unique to Alternative 4. A more detailed description of the activities is presented in Appendix A.

Defense Program. All defense-related activities would be discontinued at the NTS. The Tonopah Test Range would continue to conduct the passive tests identified under Alternative 1 and described in Appendix A.

Waste Management Program. Under Alternative 4, the Waste Management Program would include the activities described under Alternative 3; however, these activities would be scaled back to provide service solely for the DOE waste generated within Nevada.

Environmental Restoration Program. Environmental restoration activities would continue at current or accelerated rates. Cleanup levels and remediation could be stricter (where applicable), based on designated land use and potential return of some lands to the public domain.

Nondefense Research and Development Program. Under Alternative 4, the Nondefense Research and Development Program activities would be the same as described under either Alternative 1 or 3. The Spill Test Facility, Alternative Fuels Demonstration Projects, and Environmental Research Park activities would be as described under Alternative 1. The alternative energy and environmental management and technology development activities would be as described under Alternative 3.

Work for Others Program. Activities would be the same as those described under Alternative 2 with the one exception. It is anticipated that there would be an increased use of NTS airspace by the U.S. Air Force.

5.4.1 Nevada Test Site

Under Alternative 4, the DOE would discontinue all defense-related activities and most Work for Others Program activities. The program categories applicable under Alternative 4 are Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. However, the discontinuation or reduction of the Defense Program and Work for Others Program could result in some impacts. Therefore, all five programs are discussed under Alternative 4 when impacts are possible.

5.4.1.1 Land Use. The primary difference between this alternative and Alternative 1 is that no Defense Program activities would occur under Alternative 4. Consequently, no land-use demands would be made to accommodate the construction and operation of advanced nuclear weapons simulators; construction of a facility for storing nuclear weapons and their components and for their assembly and disassembly; long-term storage of weapons-usable fissile material; a large, heavy-industrial facility; and the National Ignition Facility.

The DOE would relinquish its control of R-4808 airspace. It is assumed that the U.S. Air Force would retain control of that portion of R-4808 not overlying the NTS. Airspace over the NTS would then be publicly accessible. The bulk of the activities anticipated under this alternative would be the continuation of Waste Management Program operations in support of NTS environmental restoration and other NTS activities associated with projects sited at the NTS under Alternative 4. This alternative would result in approximately 4,600 acres of new ground disturbance. The single most important construction activity, which also appears under Alternatives 1 and 3, would be the Solar Enterprise Zone, which would disturb 2,402 acres.

Waste Management Program. Waste Management Program operations and construction would include all the activities listed under Alternative 1, with the restriction that these services be provided solely for the DOE waste generation within Nevada. The construction of new or expanded disposal facilities would change the land-use status of limited areas adjacent to existing disposal sites. The areas used for waste disposal would be committed for the long term to that use and would be unavailable for other, less restricted uses.

Environmental Restoration Program. The Environmental Restoration Program under Alternative 4 would continue as identified under Alternative 1. The acceleration of some actions might allow more rapid changes in the land-use status of areas that contain contaminated soils and former industrial sites.

Nondefense Research and Development Program. Under Alternative 4, land areas previously designated as nuclear test zones and nuclear and high-explosive test zones would be designated as Nondefense Research and Development Program testing zones; this new zone designation would represent an approximately 2,849 km² (1,100 mi²) increase in land use. In addition, minor modifications to land-use status would be needed to accommodate some actions. The construction and operation of a Solar Enterprise Zone facility would preclude other land use within the zone.

Work for Others Program. Under Alternative 4, it is anticipated that the NTS airspace would be accessible by the public. Conventional weapons demilitarization activities would not be sited at the NTS under this alternative, and defense-related research and training by other government agencies would not be conducted at the NTS. Therefore, these lands would be available for a greater variety of unrestricted land uses. However, the DOE would be required to provide for overflights and

inspections of the NTS in accordance with international arms control treaties.

Potential Public Uses of Relinquished NTS Lands. Under Alternative 4, likely public uses of NTS lands would include educational and recreational activities.

Public education use of NTS lands would focus on the unique and remote characteristics of the site and the availability of existing site support for public activities. A nuclear era museum located at the NTS highlighting the testing activities would be an important contribution to a better understanding of the United States' nuclear programs. The NTS is the only place where the public can see how the nuclear era unfolds; they can revisit nuclear rocket development and see the impacts that weapons effects testing had on common structures. The public could also learn more about the testing conducted for peaceful purposes (Plowshare tests), as well as the other programs that were part of the nuclear era. Student education through field trips and studies have taken place in the past to a limited extent. This type of education would allow students to see firsthand some of the nuclear testing impacts, as well as the geology and biology on the NTS. The environmental impacts as a result of this activity would be relatively minor.

Public recreation on the NTS would focus on scenic areas, such as Timber Mountain and the isolated forested areas. Timber Mountain is a National Natural Landmark and is one of the best examples of a caldera with all the associated volcanic features. This area is also the location of American Indian petroglyphs. The road system on the NTS would provide a location for such events as 42 km (26 mi) marathon runs, closed-circuit bicycle and car races, and similar activities. The variety of terrain, the ability to control traffic in a cost-effective manner, and the available medical facilities make this an attractive alternative. Deer herds on the NTS have not been hunted within the site boundaries for many decades. A hunt could be run similar to the bighorn sheep trophy hunt, in which a drawing is held for a limited number of hunters who must attend a one-day training session to be properly oriented. These events could represent a widening of the types of land uses on the NTS to include dispersed and organized recreation. Additional recreational use could result in impacts to other natural and cultural resources found on the NTS.

Relinquished NTS Lands. Under Alternative 4, an area of approximately 526 km^2 (203 mi^2) of currently withdrawn land has been identified for possible turn-back to the jurisdiction and management of the U.S. Bureau of Land Management pursuant to the provisions of the Federal Land Policy and Management Act. Should such an option be pursued, the U.S. Bureau of Land Management would conduct an evaluation of the suitability of the land for return to the public domain, and assess the value of the resources associated with the land for existing programs. If the lands were accepted for return to the public domain, the U.S. Bureau of Land Management would determine the proper management prescriptions for the lands being returned.

5.4.1.1.1 Site-Support Activities—The NTS site-support activities would be reduced under this alternative. However, land-use designations are not expected to be impacted by this reduction in site support. Facilities associated with security and environmental monitoring would remain at a reduced level. Services required for this activity under Alternative 4 would be reduced.

UTILITIES—The power grid would remain largely as it is described under Alternative 1. Parts of the grid could be shut off and abandoned; however, the lines and substations would not be removed because of the potential for future power requirements in remote locations to support environmental restoration and other turn-back activities. Power would continue to be provided by the existing 138 kV supply lines.

Approximately 161 km (100 mi) of water supply lines would continue to be used for distributing water to various facilities around the NTS. In addition to the distribution lines, there would be numerous wells, water storage sumps, and tanks. Many of these water distribution and storage utilities would be shut down and abandoned or removed. It is not known at this time which utilities would need to remain functional to support the environmental restoration activities. The wells and storage utilities that support waste management activities in Areas 3 and 5 would remain in use. Some of the utilities in Areas 23 and 25 would also

remain in use to support base camp and Yucca Mountain Project activities.

The NTS sewage handling systems include sewage lagoons and septic tanks with leachfields. Most of the sewage handling systems would be discontinued and remediated. The sewage systems in Areas 3 and 5 might need to be expanded to provide coverage for the increase in waste management activities. The sewage systems in Areas 23 and 25 might receive some reduction in capacity.

COMMUNICATION—Radio communications would be controlled through remote-control units. These units would use telephone-radio-telephone order lines connected to local transceivers. Mobile radio communications, which are primarily provided by digital microwave systems, would be reduced from three separate systems to one or two systems as mandated by the level of activity. Central monitoring of NTS radio nets would continue to be maintained at Station 900. This station function would remain as an emergency reporting point for both radio and telephone. The public safety network, which provides coverage to most of Nevada and portions of nearby states, would be abandoned.

The system components would remain intact. It would take less effort and expense to maintain the system than it would to remove the system. The existing features of the NTS telecommunications network would be more than adequate to support the level of activity at the NTS.

Video and data communications would continue to be provided by the digital microwave system as it is at this time. This system would continue to provide for security and alarms, as necessary.

Retention of site infrastructure would require that the associated land uses remain similar to the present uses. Land use is already established in a zone surrounding the radioactive waste management facilities in Areas 3 and 5. Neither area would require additional land designated for disposal. Land so used would be restricted for most other uses for the long term to ensure the integrity of the closure and the safety of those who might inadvertently breach the waste. Construction of the Solar Enterprise Zone facilities would represent a long-term, single-land use, which could be reversed when the project is completed and the site restored.

5.4.1.1.2 Airspace—There are few proposed changes in airspace associated with the other federal agency programs within this area. These changes would be local and would not change the overall NAFR Complex airspace structure. These changes are usually minor path changes to accommodate population changes in the areas of concern. The changes might redefine the boundaries between restricted areas R-4807 and R-4808 and redesignate a restricted area to facilitate joint use by civilian aircraft.

Under this alternative, the restricted airspace that overlies the NTS would be relinquished and would be available for commercial and general aviation use.

All defense-related activities at the NTS would be discontinued. Therefore, the discontinuation of airspace operations at the NTS associated with the Defense Program and Work for Others Program under this alternative would result in a beneficial impact for civilian air traffic.

The DOE would be required to provide for overflights and inspections for the NTS in accordance with international arms control treaties.

It is estimated that 200,000 people could visit the NTS for recreational purposes each year. It is possible that some visitors would come by air; however, the anticipated air traffic would be minimal, and its impact on airspace would be insignificant.

There are few proposed changes in airspace associated with the NAFR Complex mission (SAIC/DRI, 1991). These changes would be local and would not change the overall airspace structure. Examples of changes would include relocation of a visual military training route to avoid residential areas in Pahrump, redefining the boundary between the restricted areas R-4807 and R-4808, and redesignating a restricted area to facilitate joint use by civil aircraft.

5.4.1.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4.

The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.1.2.1 On-Site Traffic—Traffic generated within the NTS as a result of the land use, projects, and activities associated with Alternative 4 is estimated to be 12,180 trips per day. Table 5.4-1 shows the estimates of average daily trips for each program. The daily trips were distributed on site, based on existing travel patterns for commuters and the current NTS areas affected by each program. Table 5.4-2 summarizes the average daily traffic volume for the key roadways on the NTS for Alternative 4. The portion of the average daily traffic volume that would be attributable to each program is also provided. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to the volumes assigned to each segment on Table 5.4-2 shows that no roadway would experience any significant traffic congestion under Alternative 4.

Defense Program. Impacts resulting from the discontinuation of Defense Program activities under Alternative 4 would be the same as those described for Alternative 2 in Section 5.2.1.2.1.

Waste Management Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with waste management is estimated to be 200 average daily trips under Alternative 4.

Road 5-01, the access to the Radioactive Waste Management Site in Area 5, is scheduled for improvement by the second quarter of Fiscal Year 1997. The improvement project is described under Alternative 1 in Section 5.1.1.2.1. No adverse effects on traffic flow would occur as a result of the Waste Management Program.

Environmental Restoration Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Environmental Restoration Program is estimated to be 480 average daily trips for Alternative 4. No adverse effects on traffic flow would occur as a result of the Environmental Restoration Program.

Nondefense Research and Development Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Nondefense Research and Development Program is estimated to be 10,680 average daily trips under Alternative 4. Traffic volumes on Jackass Flats Road, Cane Spring Road, and the portion of Mercury Highway that is south of Cane Spring Road would be approximately 5,300 vehicles per day for each segment, representing a substantial increase over Alternative 1. These volumes, however, represent on-site trips that were assumed to be uniformly distributed throughout the day. This, together with the fact that all on-site trips were also assumed to have an endpoint in Mercury, shows that no adverse effects on traffic flow would occur as a result of the Nondefense Research and Development Program.

Work for Others Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Work for Others Program is estimated to be 60 average daily trips under Alternative 4. No adverse effects on traffic flow would occur as a result of the Work for Others Program.

Site-Support Activities. Traffic generated on the roads within the NTS as a result of site-support activities is estimated to be 760 average daily trips under Alternative 4. No adverse effects on traffic flow would occur as a result of site-support activities.

5.4.1.2.2 Off-Site Traffic—The major traffic generators at the site with the various programs under Alternative 4 would be the construction and operations employees and their associated activities. Table 5.4-3 shows the changes in the average daily vehicle trips generated by each program activity for the years 1996, 2000, and 2005. These overall changes reflect reductions for the Defense Program, Work for Others Program, and site-support activities and slight increases for other programs relative to Alternative 1.

Under Alternative 4, vehicular traffic would decrease on key roadways from 1996 to 2005. The greatest reduction in traffic would occur in 2000 and 2005 on the access highway to the NTS, by approximately 120 vehicles during the peak hour.

Table 5.4-1. Average on-site daily vehicle trip generation (one-way trips) by program, Alternative 4

Program	Trips per Day	Difference from Alternative 1
Defense	0	-635
Waste Management	200	+55
Environmental Restoration	480	+90
Nondefense Research and Development	10,680	+10,500
Work for Others	60	-80
Site-Support Activities	760	-1,120

The ramps on the Mercury interchange and U.S. Highway 95 between Mercury and Las Vegas would also experience a reduction of 100 vehicles during peak hours. The traffic on all other key roads are likely to be reduced by less than 100 vehicles. Trip generations would remain constant after an initial reduction in 1997. The projected peak-hour traffic on key roads and the associated level of service that would result under Alternative 4 for 1996, 2000, and 2005 are shown in Table 5.4-4. By 2005, all key roads in the immediate vicinity of the site (U.S. Highway 95, the Mercury interchange ramps, and the access highway to the site State Route 433) would continue to operate at level of service C or better, which is acceptable according to Association of American State Highway and Transportation Officials Standards.

Key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) already operate at levels of service ranging from A to F; by 2000, they would all deteriorate to unacceptable level of service F. These conditions would prevail even without Alternative 4 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam already operates at unacceptable level of service F, and its level of service would continue to deteriorate further with or without this alternative because of its geometry (steep grades and narrow curves) and partially to its moderate traffic volume and truck traffic. All other key roadways, in general, would continue to operate at level of service C or better (Table 5.4-4).

The conditions described above would prevail with or without Alternative 4 and with or without any single program activity. The following sections address the contribution of each program to traffic impacts.

Defense Program. Under Alternative 4, a vehicle trip reduction on a typical weekday of 330 trips under Alternative 1 would occur by 2005. These trips account for construction and operations activities generated by workers at the site and would occur at the access road off U.S. Highway 95.

Waste Management Program. Under Alternative 4, the Waste Management Program would generate 40 more vehicle trips than Alternative 1.

Environmental Restoration Program. Under Alternative 4, employees associated with the Environmental Restoration Program would generate 90 more trips than Alternative 1.

Nondefense Research and Development Program. Under Alternative 4, employees associated with the Nondefense Research and Development Program would generate 40 vehicle trips above Alternative 1 in 2005.

Table 5.4-2. Average daily traffic volumes on key NTS roadway segments, Alternative 4

Roadway	Segment	Average Daily Traffic Volume						
		Defense	Waste Management	Environmental Restoration	Nondefense Research and Development	Work for Others	Site Support Activities	Total
North								
Buckboard Mesa Rd.	Pahute Mesa Rd. to Airport Rd.	0	0	35	0	0	0	**35**
Mercury Hwy.	Tippipah Hwy. to Ranier Mesa Rd.	0	40	110	0	0	0	**150**
Pahute Mesa Rd.	Mercury Hwy. to Stockade Wash Rd.	0	0	75	0	0	0	**75**
Pahute Mesa Rd.	Stockade Wash Rd. to Buckboard Mesa Rd.	0	0	35	0	0	0	**35**
Ranier Mesa Rd.	Mercury Hwy. to Tippipah Hwy.	0	0	35	0	0	0	**35**
Tippipah Hwy.	Mercury Hwy. to Pahute Mesa Rd.	0	0	150	0	0	0	**150**
Tippipah Hwy.	Pahute Mesa Rd. to Ranier Mesa Rd.	0	0	35	0	0	0	**35**
South								
Cane Spring Rd.	Lathrop Wells Rd. to Mercury Hwy.	0	0	35	5,300	30	0	**5,365**
Jackass Flats Rd.	Mercury Hwy. to Lathrop Wells Rd.	0	0	110	5,340	30	0	**5,480**
Lathrop Wells Rd.	U.S. Hwy. 95 to Jackass Flats Rd.	0	0	35	40	0	0	**75**
Mercury Hwy.	Mercury Hwy. to Road 5-01	0	200	330	5,300	30	75	**5,935**
Mercury Hwy.	Road 5-01 to Cane Spring Rd.	0	50	295	5,300	30	75	**5,750**
Mercury Hwy.	Cane Spring Rd. to Tippipah Hwy.	0	50	295	0	0	75	**420**
Road 5-01	Mercury Hwy. to Area 5 RWMS	0	130	40	0	0	0	**170**
Road 5-07	Mercury Hwy. to Area 5 RWMS	0	20	0	0	0	0	**20**

NOTE: RWMS = Radioactive Waste Management Site.

Table 5.4-3. Average off-site daily vehicle trip change, Alternative 4

Program	1996	2000	2005
Defense	-200	-330	-330
Waste Management	40	40	40
Environmental Restoration	90	90	90
Nondefense Research and Development	40	40	40
Work for Others	-50	-80	-80
Site Support Activities	-250	-370	-370
Total (all programs):	**-330**	**-610**	**-610**

NOTE: All values are rounded to the nearest 10. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends. Trips shown are the change from Alternative 1.

Table 5.4-4. Peak-hour traffic volume and level of service on key roads, Alternative 4
(Page 1 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 @ California/Nevada state line	6,800	2,975	E	3,739	F	4,701	F
I-15 north of Sahara Avenue interchange	10,200	7,283	F	8,944	F	11,062	F
I-15 north of the downtown expressway interchange	10,200	4,413	E	5,642	F	6,971	F
I-15 just north of the 'D' and Washington interchange	10,200	4,050	D	5,086	F	6,397	F
I-15 north of the Cheyenne interchange	6,800	1,885	C	2,658	D	3,642	F
I-15 south of the Lamb Blvd. interchange	6,800	641	A	832	A	1,082	B
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	633	A	882	A	1,195	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,753	C	2,002	C	2,316	C
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	325	A	407	A	512	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	7,297	F	9,165	F	11,528	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,588	D	3,253	F	4,090	F
Rancho Road, SR 599 east of the northern U.S. 95/Rancho Road interchange	6,800	1,164	B	1,891	C	2,845	E
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	791	A	893	A	1,077	B
U.S. Hwy. 95 just east of Mercury interchange	6,800	303	A	284	A	318	A
U.S. Hwy. 95 just south of Boulder City	2,200	599	C	635	C	680	C
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	29	B	22	B	22	B
Southbound on-ramp	1,300	187	B	141	B	141	B
Northbound off-ramp	1,300	187	B	141	B	141	B
Northbound on-ramp	1,300	29	B	22	B	22	B
SR 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,200	225	C	169	B	169	B

Table 5.4-4. Peak-hour traffic volume and level of service on key roads, Alternative 4
(Page 2 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
U.S. Hwy. 95, 6.1 km (3.8) mi north of Mercury interchange	2,200	276	C	311	C	362	C
U.S. Hwy. 95 @ Amargosa Valley to Beatty	2,000	59	A	63	A	72	A
U.S. Hwy. 95 north of Beatty	2,000	171	B	187	B	211	B
SR 160 south of U.S. Hwy. 95	2,000	71	A	85	A	106	A
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	815	F	977	F	1,186	F
U.S. Hwy. 93 east of westbound off-ramp of Railroad Pass interchange	6,840	2,684	E	3,219	F	3,906	F
U.S. Hwy. 93 north of I-15/U.S. 93 interchange	2,000	128	B	158	B	201	B
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	130	B	155	B	189	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	44	A	50	A	60	A
SR 375 west of U.S. 93 junction at Crystal Springs	1,500	28	A	29	A	31	A
SR 375 east of Warm Springs	1,500	11	A	10	A	11	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	13	A	12	A	13	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	19	A	18	A	20	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	96	B	85	A	75	

[a] Vehicles per hour
[b] Directional design hourly volume based on thirtieth peak hour and a 70/30 split for direction (one direction)
[c] Level of service

NOTE: SR=State Route

Work for Others Program. Under Alternative 4, employees associated with this program would generate 80 vehicle trips below Alternative 1 in 2005.

Potential Turn-Back Uses. Under Alternative 4, it is estimated that 200,000 people would visit the NTS for recreational purposes and for museum visits. Weekends would be the peak period for these visits. On average, there would be 500 to 600 persons per day, generally less than 200 vehicles per day (one way), assuming 3 persons per car and 90 percent passenger cars and 10 percent buses, or less than 40 vehicles during peak hours. This volume is not large enough to affect any level of service on any key road segment.

Site-Support Activities. Under Alternative 4, the discontinuation of programs would result in a corresponding loss of site-support personnel. A reduction of 370 vehicle trips would occur by 2005. These trips would account for activities related to roads, utilities, communications, and other site support.

5.4.1.2.3 Transportation of Materials and Waste—Under Alternative 4, no off-site transportation of low-level waste, mixed waste, or nuclear materials would occur. The waste volumes for NTS-generated waste that would be transported on-site are given in Table 5.4-5.

The human health risks associated with on-site transportation would generally be small, particularly in comparison with off-site transportation risks, primarily because of the differences in distance traveled and population densities and the lower rates of speed. On-site transportation risks would not contribute significantly to the total risk of any alternative. Results of the on-site transportation risk analysis under Alternative 4 are shown in Table 5.4-6. The highest risk would be from vehicle-related fatalities and injuries. Cargo-related risks would be small because of the low gamma activity in the NTS-generated waste and the small exposed population.

Table 5.4-5. NTS-generated waste 10-year volumes

Program	Waste Type	m^3
Total NTS low-level and mixed waste generated by all programs	Low-level waste	150,000
	Mixed waste	500

5.4.1.2.4 Other Transportation—Because Alternative 4 activities do not include direct use of local railroads, air, or other modes of transportation, direct effects on rail, air, and other modes of transportation are expected to be minimal. Furthermore, given the nature and scale of anticipated activities under Alternative 4, transportation demand for other than commuters is expected to remain minimal. There would be little indirect impact on other modes of transportation.

5.4.1.3 Socioeconomics. This section addresses the potential socioeconomic effects associated with Alternative 4. The description of socioeconomic conditions includes indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the site with

Alternative 1. In addition, public finance and public services (public education, police and fire protection, and health) are described. Alternative 1 was considered equivalent to future baseline conditions without new activities.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING—The net effect of Alternative 4 is the loss of 4,625 jobs (1,496 direct and 3,129 secondary) in 1996 and 7,981 jobs (2,748 direct and 5,233 secondary) in 2000 and 2005 (Table 5.4-7). In Clark County, this employment would generate the loss of 4,401 jobs in 1996; 7,582 in 2000; and 7,582 in 2005. In Nye County, this employment would contribute to the total loss of 179 jobs in 1996; 317 jobs in 2000; and 317 jobs in 2005 (see Figure 5.1-1).

The total earning levels are estimated to decrease by $157.0 million in 1996 and $277.0 million in 2000 and 2005. Of these decreased earnings, Clark County would lose a total of $149.4 million in 1996 and $263.3 million in 2000 and 2005. For Nye County, this economic activity would generate a decrease in earnings of $7.5 million in 1996 and $13.7 million in 2000 and 2005.

Out-migration analysis was based on historical unemployment. The lowest unemployment rate for Clark County in the last 20 years was 4.7 percent in 1990, and the highest was 10.9 percent in 1975 and 1982. The volatile unemployment rates and the high increase in population indicate that a midpoint would provide a more realistic analysis. For this analysis, 7.7 percent was assumed for Clark County unemployment. The same analysis was done for Nye County. The lowest unemployment rate was 1.8 percent in 1970, and 10.9 percent was the highest rate in 1987. A more realistic assumption rate of 4.7 percent was used for Nye County. Alternative 4 would not generate or lose enough jobs to reach the base unemployment rate. Therefore, no out-migration would be triggered, and it can be assumed that no change in population or housing demand would be generated.

Defense Program. Total employment lost as a result of Alternative 4 would include both direct and secondary jobs. In the region of influence, in addition to the loss of 1,472 direct positions, an additional 2,802 secondary positions would be lost

Table 5.4-6. On-site transportation risks from NTS-generated wastes, Alternative 4

Consequence	Risk
Vehicle-related fatalities	0.06
Radiation-induced cancer fatalities	9×10^{-5}
Radiation-induced detriment	7×10^{-5}

Table 5.4-7. Economic activity effects for Clark and Nye Counties, 1996, 1997, 1998, 2000, and 2005 totals for all programs, Alternative 4

Total Alternative 4	1996	1997	1998	2000	2005
Alternative 4					
Clark County					
Population	1,077,576	1,112,348	1,148,241	1,223,541	1,380,920
Total Jobs	503,137	516,334	533,240	568,706	642,831
Unemployment Rate	6.6	7.2	7.1	7.0	6.9
Personal Income ($Millions)	21,094.5	22,151.8	23,371.1	25,809.8	31,906.3
Nye County					
Population	27,407	28,918	30,511	33,966	38,516
Total Jobs	10,811	11,279	11,918	13,304	15,128
Unemployment Rate	6.7	7.8	7.7	7.4	6.9
Personal Income ($Millions)	470.3	497.1	534.8	618.1	761.9
Changes from Alternative 1 (Alternative 4 effects)					
Clark County					
Population	0	0	0	0	0
Total Jobs	-4,401	-7,582	-7,582	-7,582	-7,582
Unemployment Rate	0.8	1.4	1.3	1.2	1.1
Personal Income ($1,000)	-212.6	-374.6	-374.6	-374.6	-374.6
Nye County					
Population	0	0	0	0	0
Total Jobs	-179	-317	-317	-317	-317
Unemployment Rate	1.5	2.6	2.5	2.2	1.7
Personal Income ($1,000)	-10.4	-18.8	-18.8	-18.8	-18.8

for a total of 4,274 jobs. Secondary positions are lost because of the decrease in procurement and personal consumption expenditures of site personnel. In Clark County, the reduction in civilian employment (4,060 jobs) would contribute to the total increase in the unemployment rate from 5.8 percent to 6.9 percent in 2005. In Nye County, the decrease in employment would result in a loss of 170 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 7.1 percent in 2005.

Waste Management Program. In the region of influence, this program would create a total of 454 jobs, including 157 direct and 297 secondary positions, starting in 1996 and continuing through 2005. In Clark County, this program would contribute 431 jobs (141 direct and 290 secondary), and in Nye County, it would contribute 18 jobs (11 direct and 7 secondary). In Clark County, this increase in civilian employment (431 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8. In Nye County, the increase of 18 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Environmental Restoration Program. In the region of influence, this program would create a total of 1,150 jobs, including 396 direct and 754 secondary positions, starting in 1996 and continuing through 2005. In Clark County, this program would contribute 1,093 jobs (357 direct and 736 secondary), and in Nye County, it would contribute 46 jobs (28 direct and 18 secondary). In Clark County, this increase in civilian employment (1,093 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8. In Nye County, the increase of 46 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Nondefense Research and Development Program. In the region of influence, the Nondefense Research and Development Program would create 468 jobs (including 161 direct and 307 secondary positions) starting in 1996 and continuing through 2005. In Clark County, this program would contribute 444 jobs (145 direct and 299 secondary) in 2005. In Nye County, this program would contribute 19 jobs (11 direct and 8 secondary) in 2005. In Clark County, this increase in civilian employment (444 jobs) would help maintain the total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8 percent. In Nye County, the increase of 19 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Work for Others Program. In the region of influence, in addition to the loss of 350 direct positions, an additional 666 secondary positions would be lost for a total of 1,016 jobs under Alternative 4. Secondary positions are lost because of the decrease in procurement and personal consumption expenditures of site personnel. In Clark County, the reduction of civilian employment (965 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8 percent. In Nye County, the reduction of 40 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Site-Support Activities. In the region of influence, in addition to the loss of 1,640 direct positions, an additional 3,123 secondary positions would be lost for a total of 4,763 jobs. In Clark County, the reduction of civilian employment (4,525 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8. In Nye County, the reduction of 189 jobs would help maintain the totalunemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

PUBLIC FINANCE—The fiscal effects of Alternative 4 are presented in this section. Table 5.4-8 outlines the projected financial summary for Fiscal Years 2000 and 2005 under Alternative 4. The fiscal impact of each alternative can be determined by subtracting its income statement totals from the Alternative 1 future baseline. The remaining fiscal impact is the specific impact associated with each alternative.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed in Public Finance, Section 4.1.3.

Under Alternative 4, revenues for Clark County would increase because of increases in personal income and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures (see discussion on capital projects in Public Finance, Section 4.1.3), Alternative 4 would result in revenues less expenditures of a negative $4,289,000 in Fiscal Year 2000. Clark County is anticipated to achieve a positive fiscal position in Fiscal Year 2001. In Fiscal Year 2005, revenues less expenditures are expected to be $35,254,000. The fund balance (or reserves) as a percentage of current expense is expected to be 246 percent in 2000 and 247 percent in 2005. To compare with Alternative 1, Clark County revenues over expenditures would be $1,787,000 more in 2000 and 2005.

City of Las Vegas. Under Alternative 4, revenues over expenditures for the city of Las Vegas are expected to become positive in Fiscal Year 1995 because of increases in personal income and total employment in the city. Assuming continued increases in revenues and expenditures, this alternative would result in revenues less expenditures of $13,652,000 in Fiscal Year 2000. It is predicted that by Fiscal Year 2005, revenues over expenditures would be $15,708,000. The fund balance as a percentage of current expense is expected to be 179 percent in 2000 and 269 percent in 2005.

To compare with Alternative 1, revenues over expenditures would be $728,000 less in 2000 and $727,000 less in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue to outpace revenues. Revenues over expenditures in Fiscal Year 2000 would be a negative $7,229,000 and a less negative $6,732,000 in Fiscal Year 2005. This is despite increases in personal income and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to slowly grow to 1993 levels by Fiscal Year 2001. The fund balance as a percentage of current expense is expected to be 62 percent in Fiscal Year 2000 and 92 percent in Fiscal Year 2005.

Clark County School District. Revenues over expenditures would be the same as Alternative 1. This is because school enrollment, along with revenues and expenditures, is largely population-driven, and the population levels under Alternatives 1 and 4 are the same. In other words, Alternative 4 would cause no change in population growth as compared to the future baseline, which is Alternative 1.

Nye County. Under Alternative 4, revenues for Nye County would increase slightly because of increases in personal income and total employment. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1999. This alternative would result in revenues less expenditures of $1,549,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,437,000. The fund balance as a percentage of current expense is expected to be 56 percent in Fiscal Year 2000 and 96 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $18,000 less in 2000 and 2005.

Town of Tonopah. Revenues and expenditures for the town of Tonopah would increase slightly because of increases in personal income and total employment in Nye County. Assuming continued increases, Alternative 4 would result in revenues less expenditures of $78,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $75,000. The fund balance as a percentage of current expense would be 127 percent in Fiscal Year 2000 and 185 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $973 less in 2000 and $867 less in 2005.

Table 5.4-8. Projected financial summary for Fiscal Years 2000 and 2005, general, special revenues, debt service, and capital projects funds, Alternative 4

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($4,289,294)	$525,981,796	$1,293,385,985	245.90%
City of Las Vegas	$13,651,877	$196,970,437	$351,723,082	178.57%
City of North Las Vegas	($7,228,619)	$47,082,837	$29,273,582	62.17%
Clark County School District	($15,067,362)	$751,358,806	$124,171,528	16.53%
Nye County	$1,548,679	$25,905,977	$14,389,689	55.55%
Town of Tonopah	$77,644	$642,646	$818,617	127.38%
Town of Pahrump	$219,195	$944,592	$1,587,323	168.04%
Nye County School District	($1,402,124)	$26,698,631	($438,631)	-1.64%
Fiscal Year 2005				
Clark County	$35,253,767	$857,606,688	$2,118,927,717	247.07%
City of Las Vegas	$15,707,678	$210,832,569	$567,900,255	269.36%
City of North Las Vegas	($6,731,905)	$50,452,640	$46,204,023	91.58%
Clark County School District	($11,167,703)	$848,002,970	$190,429,375	22.46%
Nye County	$3,436,783	$27,922,658	$26,932,650	96.45%
Town of Tonopah	$74,514	$646,767	$1,196,893	185.06%
Town of Pahrump	$309,912	$1,094,844	$2,965,888	270.90%
Nye County School District	($135,592)	$30,272,304	$4,200,315	13.88%

Town of Pahrump. Under Alternative 4, revenues for the town of Pahrump would increase slightly because of increases in personal income and total employment in Nye County. Assuming continued increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, this alternative would result in revenues less expenditures of $219,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $310,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 168 percent in Fiscal Year 2000 and 271 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $5,000 less in 2000 and 2005.

Nye County School District. Revenues over expenditures would be the same as under Alternative 1. This is because school enrollment along with revenues and expenditures are largely population-driven, and the population levels under Alternatives 1 and 4 would be the same. In other words, Alternative 4 would cause no change in population growth as compared to the future baseline, which is Alternative 1.

PUBLIC SERVICES—Effects to key local public services are determined by the change in demand for personnel. The public service impacts can be determined by subtracting total personnel required from the Alternative 1 future baseline. The addition or reduction in personnel required would be the specific impact associated with that alternative. The current levels of service per 1,000 population discussed in Chapter 4 are assumed to continue. Alternative 4 has no in- or out-migration triggered by high or low levels of employment; therefore, this alternative has the same population level as Alternative 1. In all cases, there is no change in levels of service over the future baseline (Alternative 1).

5.4.1.4 Geology and Soils. This section addresses the potential impacts to geology and soils in each program under Alternative 4.

Defense Program. Under Alternative 4, the impacts to geology and soils would be the same as those described under Alternative 2 in Section 5.2.1.4.

Waste Management Program. Waste Management Program activities are anticipated to result in the same adverse impacts to geologic media, processes, or resources as described under the Waste Management Program under Alternative 1 in Section 5.1.1.4.

Environmental Restoration Program. Environmental Restoration Program activities are anticipated to result in adverse impacts to geologic media, processes, or resources as described under the Environmental Restoration Program under Alternative 1 in Section 5.1.1.4.

Nondefense Research and Development Program. Nondefense Research and Development Program activities are anticipated to result in the same adverse impacts to geologic media, processes, or resources as described under Alternative 1 and 3, Sections 5.1.1.4 and 5.3.1.4, respectively.

Work for Others Program. Work for Others Program activities are not anticipated to result in the same adverse impacts to geologic media, processes, or resources beyond those from past activities as described in the Work for Others Program under Alternative 1 in Section 5.1.1.4.

Site-Support Activities. The impacts associated with site-support activities under Alternative 4 would be the same as those discussed under Alternative 3 in Section 5.3.1.4.

5.4.1.5 Hydrology. The section addresses the impacts of each program to surface hydrology and groundwater. Because groundwater is the main source of water at the NTS, water resource impacts are presented in the groundwater section.

5.4.1.5.1 Surface Hydrology—The environmental impacts to surface hydrology from each program under Alternative 4 are presented in this section.

Defense Program. Under Alternative 4, all defense-related activities would be discontinued. Therefore, the impacts would be the same as those described under Alternative 2 in Section 5.2.1.5.

Waste Management Program. Waste Management Program activities are anticipated to result in the same adverse impacts to the surface hydrologic environment as described for Waste Management under Alternative 1 in Section 5.1.1.5.

Environmental Restoration Program. Environmental Restoration Program activities are anticipated to result in the same adverse impacts to the surface hydrologic environment as described for Environmental Restoration under Alternative 1 in Section 5.1.1.5.

Nondefense Research and Development Program. Nondefense Research and Development Program activities are anticipated to result in the same adverse impacts to the surface hydrologic environment as described for the Nondefense Research and Development Program under Alternatives 1 and 3 in Sections 5.1.1.5 and 5.3.1.5, respectively.

Work for Others Program. Work for Others Program activities are not anticipated to result in adverse impacts to the surface hydrologic environment beyond those from past activities as

described for the Work for Others Program under Alternative 1 in Section 5.1.1.5.

Site-Support Activities. The impacts associated with site-support activities under Alternative 4 would be the same as those discussed under Alternative 3.

5.4.1.5.2 Groundwater—The demand for water resources under Alternative 4 would be greatly reduced. In fact, the demand for water resources would be substantially less than those of recent years because of the cessation of actions required to maintain test readiness.

Defense Program. Under Alternative 4, the impacts to groundwater would be the same as those described under Alternative 2 in Section 5.2.1.5.

Waste Management Program. Under Alternative 4, the water demand for Waste Management Program activities would be reduced from Alternative 1 levels. Because the demand for water would be insignificant (less than 1,233 m^3/yr [1 ac-ft/yr]), there would be no significant impacts associated with groundwater withdrawals for waste management.

Environmental Restoration Program. The demand for water resources for Environmental Restoration Program activities would accelerate under Alternative 4 if specific actions are accelerated; however, the total demand for water for environmental actions would still be quite small, less than 2.5×10^5 m^3 (200 ac-ft/yr). No significant impacts on water resources are anticipated because of an acceleration of Environmental Restoration Program activities under Alternative 4.

Nondefense Research and Development Program. The actions under Alternative 4 for this program are the same as those under Alternative 3; therefore, the expected impacts on water resources would be similar. The major demand for water would be for the Solar Enterprise Zone. The impacts would be as described under Alternative 3, except that any reductions in underflow to downgradient basins would be reduced. No significant impacts on water resources are anticipated under Alternative 4.

Work for Others Program. The water demand for the Work for Others Program under Alternative 4 would be reduced from Alternative 1. Because the demand for water would be insignificant, there are no significant impacts associated with groundwater withdrawals for the Work for Others Program.

Site Support Activities. The reduction in site support activities and personnel would result in an overall decrease in water demand. However, support activities for environmental restoration actions might offset this water demand reduction.

5.4.1.6 Biological Resources. The Solar Enterprise Zone Project would significantly increase the risk of tortoises being crushed during construction and would remove approximately 2,400 acres of undisturbed habitat. Surface-disturbing activities may kill or displace wildlife such as small mammals, reptiles, and soil-dwelling invertebrates. If ground clearing for construction occurs during the breeding season, the eggs of birds in nests on the ground within a project area may be destroyed. Most birds that breed on the NTS are protected under the Migratory Bird Treaty Act. Under this alternative, approximately 14,300 acres may be disturbed. This project would also greatly increase traffic compared to Alternative 1 and thus the risk of accidental crushing of tortoises. The Alternative Energy Project would be sufficiently large to remove small localized populations depending on final siting decisions. Given these potential impacts of the Alternative Energy Project, Alternative 4 could reduce biodiversity in the region.

Defense Program. Under Alternative 4, the impacts to biological resources would be the same as those described under Alternative 2 in Section 5.2.1.6.

Waste Management Program. Under Alternative 4, this program would consist of activities in Areas 3, 5, 6, and 11 on the NTS. Activities at these sites would be similar to those described under Alternative 1, and only 11 acres of habitat would be disturbed; therefore, the impacts of this program would be less than those described under Alternative 1.

Environmental Restoration Program. Under Alternative 4, activities from this program are similar to those described under Alternative 1, except that the rate at which these activities would be initiated and completed is likely to be accelerated; therefore, impacts would also be similar.

Nondefense Research and Development Program. Five of the projects in this program would be in operation under Alternative 4. For four of these projects (Environmental Management and Technology Development, Alternative Fuels Demonstration Projects, National Environmental Research Park, and Spill Test Facility), the impacts would be similar to those described under Alternative 1. Activities and impacts for the fifth, the Alternative Energy project, would be the same as those described under Alternative 3.

Work for Others Program. The only activity that would occur is treaty verification; therefore, there are no anticipated impacts on biological resources.

Site-Support Activities. Activities associated with site-support activities should be about 75 percent less than under Alternatives 1 and 3. About 18 acres of habitat would be disturbed during construction and maintenance of roads under Alternative 4. As was concluded under Alternative 1, these activities would have little or no impact on biological resources.

Potential Public Uses of Relinquished NTS Lands. Activities associated with these proposed uses are not likely to adversely affect biological resources on the NTS. Trophy hunts for deer would be run by the Nevada Division of Wildlife with the intent to provide recreation while maintaining healthy herds. Few individuals will be removed and population viability will not be adversely affected. Other public uses of the NTS for such activities like educational tours or bike and car racing are not expected to significantly impact biological resources as long as no off-road vehicle use is permitted.

5.4.1.7 Air Quality. This section addresses the potential effects that the five programs and site-support activities of the NTS might have on regional air quality. The region of influence for this air quality analysis includes Nye and Clark counties, Nevada. Construction and mobile-source emissions are shown in Table 5.4-9, and site-support activities stationary-source emissions are shown in Table 5.4-10.

Carbon monoxide emissions from mobile sources in the Las Vegas Valley nonattainment area would be approximately 61 tons per year (40 percent of 153 tons, see Table 5.4-9 and Section 5.1.1.7). This value is below the 100 ton carbon monoxide de minimus value shown in Table 5.1-14; therefore, a general conformity analysis would not be required for this alternative.

Defense Program. Under Alternative 4, the impacts to air quality would be the same as those described under Alternative 2 in Section 5.2.1.7.

Even a doubling in the increased use of airspace would contribute only about 0.10 percent to the allowable ambient pollutant surface concentrations (SAIC/DRI, 1991). Thus, the emission reduction would provide a small beneficial impact on the regional air quality.

Waste Management Program. Waste Management Program impacts under Alternative 4 would be the same as those described under Alternative 1. No new construction would occur, and fugitive dust emissions were not estimated. No air quality impacts are anticipated.

Environmental Restoration Program. Under this alternative, the Environmental Restoration Program impacts would be the same as those described under Alternative 3.

Nondefense Research and Development Program. Under Alternative 4, impacts would be the same as those described under Alternative 3.

If lands are redesignated as turn-back areas, one potential use that has been proposed is a nuclear era museum. Available facilities would be used and no new construction would be required. It has been estimated that about 200,000 people would visit the museum each year. Exhaust emissions would be produced by the visitors' vehicles. Assuming an average of three occupants per vehicle, approximately 66,700 vehicles would visit the area

each year. For the purpose of emission calculations, it was assumed that a trip would consist of 145 km (90 mi) in Nye County and 97 km (60 mi) in Clark County. The 145 km (90 mi) in Nye County would include travel on the site.

Work for Others Program. Emissions from increased use of NTS airspace would have a negligible effect on surface air quality. A doubling of airspace usage would produce no more then 0.10 percent of the allowable surface-pollutant concentration (SAIC/DRI, 1991). There would be no construction activity on-site, and off-site emissions would be negligible.

Site-Support Activities. Emissions from NTS stationary sources related to site-support activities are shown in Table 5.4-10. Examples of the sources include boilers, fuel storage tanks, and a concrete batch plant. Portable compressor emissions are also included. Total Nye County emissions are presented in the table for comparison with NTS emissions. These emissions were obtained from the Bureau of Air Quality (State of Nevada, 1995). It is anticipated that 14 acres of land would be disturbed, generating 4.2 tons of fugitive dust (PM_{10}) emissions.

RADIOLOGICAL AIR QUALITY—Impacts to the air quality from radioactive effluents under Alternative 4 would be the same as under Alternative 2.

5.4.1.8 Noise. This section addresses the potential effects of the five programs and site-support activities on noise.

Defense Program. Under Alternative 4, the impacts of noise would be the same as those described under Alternative 2 in Section 5.2.1.8.

Waste Management Program. Noise impacts associated with Waste Management Program activities under Alternative 4 would be similar to those described under Alternative 1 in Section 5.1.1.8.

Environmental Restoration Program. Noise impacts from Environmental Restoration Program activities under Alternative 4 would be the same as described under Alternative 1 in Section 5.1.1.8. The noise levels produced by environmental restoration activities with this alternative would produce only minor noise impacts, both on site and off site.

Nondefense Research and Development Program. Noise impacts under Alternative 4 of the Nondefense Research and Development Program would be the same as those discussed under Alternative 1, in Section 5.1.1.8.

Work for Others Program. Overflights to support treaty verification are flown at high altitudes and would not be detectable on or near the NTS.

Site-Support Activities. Transportation noise levels on the site would be minimal and would not produce any noise impacts.

5.4.1.9 Visual Resources. The effects of Alternative 4 on visual resources are presented in this section.

Increased public access for museum visits, road races, special hunts, and other recreation would make substantially more area of the NTS visible to increasing numbers of visitors, thus increasing the impact of existing or new development on visual resources. However, much of the landscape character is common to the region. Some operations would produce PM^{10} and mobile-source emissions.

Defense and Work for Others Programs. Under Alternative 4, all facilities associated with each program would be abandoned in place. Only maintenance necessary for safety would occur. There could be a slow deterioration of facilities; however, there would be little change in the overall appearance of the existing landscape. Sensitivity levels could increase because of greater public access. Therefore, impacts to visual resources would be negligible.

Waste Management Program. Under Alternative 4, the Waste Management Program would continue its activities at a reduced level. No new ground disturbance would occur, and activities would take place in areas currently used for waste management. Impacts to visual resources would be negligible.

Table 5.4-9. Summary of Nevada Test Site construction emissions and mobile source emissions (on site and off site), tons per year, Alternative 4

Program	Construction	Mobile Sources								
		On Site			Off Site					
					Nye County			Clark County		
	Fugitive PM_{10}[a]	CO[b]	VOC[c]	NO_x[d]	CO	VOC	NO_x	CO	VOC	NO_x
Defense	NA[e]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Waste Management	NA	11.50	1.56	2.05	6.09	0.91	1.58	11.83	1.76	3.07
Environmental Restoration	220.5	22.24	3.02	3.96	11.78	1.75	3.06	22.88	3.40	5.93
Nondefense Research and Development Program[f]	360	10.00	1.36	1.78	72.76	9.86	14.87	51.25	7.57	11.65
Work for Others	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Site Support Activities	4.2	64.76	8.80	11.53	34.32	5.10	8.90	66.62	9.90	17.28
Total	**584.70**	**108.47**	**14.74**	**19.32**	**124.95**	**17.62**	**28.41**	**152.58**	**22.63**	**37.93**

a. Particulate matter with a diameter equal to or less than 10 micrometers
b. Carbon monoxide
c. Volatile organic compounds
d. Nitrogen oxides
e. Not applicable
f. Includes nuclear era museum.

Table 5.4-10. Site support activities stationary source emission at the NTS and Nye County, tons per year, Alternative 4

Area	TSP [a]	SO_2 [b]	NO_X [c]	Hc [d]	Co [e]
Area 1	34.70	3.40	2.20	0.10	0.50
Area 6	6.50	0.0	0.0	0.0	0.0
Area 23	1.12	10.62	9.40	0.0	2.54
U.S. DOE Portable[f]	17.68	15.24	229.32	0.0	49.68
Fuel Storage Tanks	0.00	0.00	0.00	10.68	0.00
Total	60.00	29.26	240.92	10.78	52.72
Nye County	1,685.70	960.68	933.28	___[g]	187.68

[a] Total suspended particulates
[b] Sulfur dioxide
[c] Nitrogen oxides
[d] Hydrocarbon
[e] Carbon monoxide
[f] Compressors
[g] No data; Nye County hydrocarbon emission inventory is not complete.

Source: Bureau of Air Quality, State of Nevada, 1995.

Environmental Restoration Program. Under Alternative 4, the Environmental Restoration Program impacts would be similar to those described under Alternative 3 in Section 5.3.1.9. However, sensitivity levels could increase because of greater public access to the NTS.

Nondefense Research and Development Program. The Nondefense Research and Development Program impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.1.9.

Site-Support Activities. Approximately 14 acres of new ground disturbance would occur for site-support activities under this alternative. Most ground disturbance would be related to new road and utility corridor construction. The ground disturbance would be scattered throughout the NTS. Impacts to visual resources would be negligible.

5.4.1.10 Cultural Resources. Impacts would be similar to those listed under Alternative 3. However, the total amount of acreage disturbed will be reduced to 14,400 acres, because of a reduction in defense-related testing, reduction in the size of waste facilities, and a lack of landlord-related construction. Continued visitation and vehicular traffic could lead to vandalism or artifact collecting that could indirectly affect recorded archaeological sites and archaeologically sensitive areas.

Although archaeological surveys have not been conducted in these areas, it is estimated that more than 67 sites could be impacted by projects associated with this alternative based on surveys conducted in adjacent areas in 1994. The precise location and number of these resources are unknown until archaeological surveys are conducted. Surveys will be conducted prior to any ground-disturbing activities, and impacts would be mitigated through the measures described in Chapter 7. At least eight structures will be decommissioned under Alternative 4. If these buildings are determined to be historically significant, they would be mitigated using measures described in Chapter 7.

Defense Program. Under Alternative 4, the impacts to cultural resources would be the same as those described under Alternative 2 in Section 5.2.1.10.

Waste Management Program. Under Alternative 4, the Waste Management Program would continue its activities at a reduced level. At Area 5, construction for new facilities has been proposed. These activities may disturb the physical integrity of some cultural resources. Increased pedestrian activity and vehicular traffic could result in unauthorized artifact collecting and vandalism that could indirectly affect cultural resources.

Environmental Restoration Program. Under Alternative 4, the impacts to cultural resources would be the same as those contained in Section 5.1.1.10. All Environmental Restoration Program activities are expected to accelerate. Accelerated remediation at contaminated sites would be likely to result in both direct and indirect impacts to cultural resources.

Few sites have been recorded directly within the area of potential effect for Area 13, and impacts directly within the area of potential effect are predicted to be minimal. However, sites have been recorded in the general area, and it is likely that indirect impacts to these sites might be incurred as a result of increased visitation to the site area.

Nondefense Research and Development Program. Direct impacts to cultural resources are likely to result from the construction of new facilities and utility upgrades associated with the Solar Enterprise Zones located on the NTS and at one other off-site location. Additional facilities may be required under the Environmental Management and Technology Development Program. Construction of such facilities may also result in impacts to undiscovered cultural resources. Indirect impacts resulting from increased access to the NTS as part of the Environmental Research Park may occur.

Work for Others Program. Many activities would be discontinued under Alternative 4. The two exceptions would be for treaty verification and the increased use of NTS airspace by the U.S. Air Force. Because most activities would be discontinued under Alternative 4, there would be no impacts to cultural resources.

Site-Support Activities. Cultural resource impacts from Site-support activities under Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.1.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will no longer be impacted by defense activities; however, oversight and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted by monitoring well program and access road activities, but will be positively impacted by actions that return disturbed lands to their natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted by visits by students and researchers.

Work for Others Program at the NTS—Under Alternative 4, it is expected that American Indian cultural resources will be impacted if activities at the Spill Test Facility in Area 5, the Treatability Test Facility in Area 25, and the newly renovated decontamination pad in Area 6 are expanded. It is expected that American Indian cultural resources

will continue to be adversely impacted by military training exercises and weapons.

Defense Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Waste Management Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because there is no program at the Area 13 site and none has been identified.

Environmental Restoration Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if military training exercises and weapons tests continue.

Work for Others Program at Area 13.—Under Alternative 4, it is expected that American Indian cultural resources will be impacted if the military training exercises and weapons test continue.

5.4.1.11 Occupational and Public Health and Safety. Most of the program activities under the Defense Program and Work for Others Program would be discontinued under Alternative 4. Waste Management Program activities would be reduced in scope compared to Alternative 3. Activities under the Environmental Restoration and Nondefense Research and Development programs would be similar to Alternative 3. Table 5.4-11 summarizes the occupational public health and safety impacts for each NTS program under Alternative 4.

Impacts to public health and safety under Alternative 4 are primarily related to routine air emissions. Potential impacts to the public from routine air emissions of radioactivity and priority pollutants are discussed in Section 5.4.1.7, Air Quality. Transportation impacts, which are discussed in Section 5.4.1.2, Transportation, would be reduced by the elimination of waste shipments to the NTS from other sites.

Subsurface radioactivity from past underground nuclear weapons tests would continue to be a potential exposure pathway for the public under Alternative 4. Potential impacts to the public would be identical to those described under Alternative 1. The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000). The public exposure scenario assumes that the individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water. These impacts are not expected to occur within the 10-year timeframe of this EIS.

Defense Program. Under Alternative 4, the impacts to public health and safety would be the same as those described under Alternative 2 in Section 5.2.1.11.

Waste Management Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected changes in the worker population under Alternative 4, the Waste Management Program at the NTS is expected to result in 50 injuries to workers during routine program activities and 14 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same time period, 0.95 fatalities are expected because of routine activities, and 0.024 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records and on projected changes in the worker population under Alternative 4, occupational exposure to radiation is estimated to result in a collective dose to NTS Waste Management Program workers of about 10-person rem in 10 years. Based on the dose to health effects

Table 5.4-11. Health risks to workers and the public from program activities, Nevada Test Site, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	e	e	e	e	e	e	e	e	e	e
Waste Management	64	0.97	0.020	0.0099	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2×10^{-5}	3.8×10^{-6}
Environmental Restoration	10	0.031	0.0085	0.0034	3×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6×10^{-6}	2.4×10^{-6}
Nondefense Research and Development	8.6	0.0015	f	f	3.2×10^{-6}	0.58	f	f	1.9×10^{-4}	1.5×10^{-4}
Work for Others	e	e	e	e	e	e	e	e	e	e
Site Support Activities	19	0.033	0.046	0.018	f	f	g	g	f	f
Total	**102**	**1**	**0.075**	**0.031**	**4×10^{-6}**	**0.58**	**5.1×10^{-5}**	**2.3×10^{-5}**	**2.3×10^{-4}**	**1.5×10^{-4}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No activities
f. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified
g. No reasonably foreseeable scenarios resulting in exposure to hazardous chemicals have been identified.

correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.004 latent cancer fatalities and 0.0016 other detrimental health effects in the worker population.

The risk of accidental exposure increases the latent cancer fatality risk by 0.016 and detrimental health effect risk by 0.0064. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Waste Management Program hazardous chemical accidents has a hazard index of 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents could result in about 5.1×10^{-5} latent cancer fatalities and 2.3×10^{-5} other detrimental health effects in the population. Waste Management Program accidents involving hazardous chemicals could result in about 2.0×10^{-5} cancers in the population. No noncancer effects from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6×10^{-7} [1 in 1,700,000] per year).

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 hazardous waste storage unit, which has a probability of occurrence of 1×10^{-7} [1 in 10,000,000] per year).

Environmental Restoration Program. Based on occupational injury and fatality rates for construction and other industrial activities, and projected changes in the worker population under Alternative 4, the Environmental Restoration Program at the NTS is expected to result in 8 injuries to workers during routine program activities and about 2 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.027 fatalities are expected because of routine activities, and 0.004 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records and on projected changes in the worker population under Alternative 4, occupational exposure to radiation is estimated to result in a collective dose to NTS Environmental Restoration Program workers of about 21-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0085 latent cancer fatalities and 0.0034 other detrimental health effects in the worker population.

The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 2.8×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Environmental Restoration Program hazardous chemical accidents has a hazard index of 0.14.

The health and safety impact to the public from potential Environmental Restoration Program accidents could result in about 2.3×10^{-10} latent cancer fatalities and 1.1×10^{-10} other detrimental health effects in the population. Environmental Restoration Program accidents involving hazardous chemicals could result in about 1.6×10^{-5} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 13 site, which has a probability of occurrence of 7×10^{-7} [1 in 1,400,000] per year).

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably

foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS, which has a probability of occurrence of 7×10^{-7} [1 in 1,400,000] per year).

Nondefense Research and Development Program. Based on occupational injury and fatality rates for construction activities and on projected changes in the worker population under Alternative 4, the Nondefense Research and Development Program at the NTS is expected to result in about 9 injuries and 0.015 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of routine activities.

Based on previous NTS occupational radiation records and on projected changes in the worker population under Alternative 4, occupational exposure to radiation is estimated to result in a collective dose to NTS Nondefense Research and Development Program workers of about 11-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0042 latent cancer fatalities and 0.0017 other detrimental health effects in the worker population.

No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 3.2×10^{-6}. The risk of life-threatening noncarcinogenic effects to a single worker from Nondefense Research and Development hazardous chemical accidents has a hazard index of 0.58.

The health and safety impact to the public from potential Nondefense Research and Development Program accidents could result in about 1.9×10^{-4} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the tank farm at the Fuel Spill Test Facility, which has a probability of occurrence of 1×10^{-7} [1 in 10,000,000] per year).

Work for Others Program. Under Alternative 4, the impacts to public health and safety would be the same as those described under Alternative 2 in Section 5.2.1.11.

Site-Support Activities. Site-support activities are distributed among the program areas. Under Alternative 4, site-support activities at the NTS are expected to result in 19 injuries and 0.033 fatalities as a result of construction activities during the 10-year period evaluated by this EIS. No injuries or fatalities are projected as a result of routine site-support activities.

Occupational exposure to radiation is expected to result in a collective dose to NTS site-support workers of about 0.046-person rem in 10 years. This dose could result in about 0.063 latent cancer fatalities and about 0.025 other detrimental health effects in the worker population.

Perceptions of radiation effects are discussed in Section 4.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians' perceptions of risk. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that

Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past and present, and why we will continue to respond to future DOE activities.

5.4.1.12 Environmental Justice. Environmental Justice analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The CGTO has identified impacts to American Indian groups as a result of Alternative 4. While not physically located in Clark, Nye, or Lincoln counties, these groups have traditional ties to the NTS and surrounding areas. Impacts would include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. With Alternative 4, access impacts would be less than with Alternative 1. However, the potential for unauthorized artifact collection would be increased because of the increased number of visitors. These impacts would be perceived only by American Indian groups and would, therefore, have a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.1.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present, and future activities on the NTS have, are, or will disproportionately impact these American Indian people. Under Alternative 4, there is a high potential of adverse impacts to these issues, even though most DOE activities would be discontinued. The continuation of waste management operations, the physical activities associated with environmental restoration and other planned activities are expected to cause both risks from radiation and reduced access from the land disturbance which is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.4.2 Tonopah Test Range

Under Alternative 4 for the Tonopah Test Range, activities are restricted to the Defense Program, Environmental Restoration Program, Work for Others Program, and site support activities. Therefore, these are the only programs discussed in all sections, with the exception of Section 5.4.2.1.2, Airspace.

Defense Program. Under Alternative 4, Tonopah Test Range activities associated with maintaining readiness and assisting with the DOE weapons research and design would be in accordance with treaty requirements. Certain defense-related activities might be scaled down or discontinued.

Environmental Restoration Program. Environmental Restoration Program activities at the

Tonopah Test Range would continue at current or accelerated rates.

Work for Others Program. Under Alternative 4, the DOE would continue to support other federal agencies' programs and research and development projects, as well as provide for overflights and inspections of the Tonopah Test Range in accordance with international arms control treaties such as the Open Skies Treaty.

5.4.2.1 Land Use. There would be no significant adverse impacts on surrounding land use as a result of the cleanup goals under this alternative. Other land-use impacts would be the same as those discussed under Alternative 1.

5.4.2.1.1 Site-Support Activities—Under Alternative 4, three scenarios could occur with respect to site-support activities. If the planned programs are aligned with the DOE or other federal agencies, site-support requirements could increase by 20 percent. Otherwise, the intended users of the Tonopah Test Range would have to determine if all site-support activities could be integrated within their operations. If not, some site-support activities would cease.

Facilities would be maintained to prevent deterioration. Efforts that would be required to conserve needed services would continue. In addition, services would increase with new technologies and programs at the Tonopah Test Range. Utilities would be maintained to ensure they are in working order. Utilities that are not currently being used could be put back into service if new technologies and operations were started at the Tonopah Test Range. It is estimated that the water supply system and the wastewater system would support new activities. The estimated lifespan of the sanitary landfill would support all new activities at the Tonopah Test Range. The communications systems have the capacity to be expanded to meet the needs of new activities at the Tonopah Test Range.

5.4.2.1.2 Airspace—Airspace actions associated with Alternative 4 would most likely be similar to those discussed under Alternative 1. Maintenance of the current level of air traffic control, as well as the same airspace structure, would continue.

Defense Programs. The continuation of Defense Program operations at the Tonopah Test Range under Alternative 4 would not result in any airspace or air traffic impacts. The continued coordination with the U.S. Air Force would be required to ensure that both missions are accommodated.

Environmental Restoration Program. Environmental Restoration Program activities would have no impact on airspace at the Tonopah Test Range.

Work for Others Program. Airspace requirements under Alternative 4 would be the same as those described under Alternative 1, with the Nellis Air Force Base Air Traffic Control Facility assuming coordination of air traffic control at the Tonopah Test Range and surrounding area. The continuation of operations at the Tonopah Test Range under the Work for Others Program under this alternative would result with continued coordination between the DOE and the U.S. Air Force to ensure that both missions are accommodated.

5.4.2.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.2.2.1 On-Site Traffic—Traffic volumes on the Tonopah Test Range roadways are believed to be below 1,000 vehicles per day on any roadway. Activities associated with Tonopah Test Range programs would add a very small amount of traffic volume to these already under used roadways.

5.4.2.2.2 Off-Site Traffic—Under Alternative 4, activities at the Tonopah Test Range as a result of Defense, Environmental Restoration, and Work for Others Programs would generate only minor amounts of vehicular traffic on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). In 1993, the average daily traffic on U.S. Highway 6 near Tonopah

amounted to 1,095 vehicles. This traffic volume is far below the capacity of U.S. Highway 6 at this location. Therefore, under Alternative 4, there would be no traffic impacts on off-site roadways.

5.4.2.2.3 Transportation of Materials and Waste—Under Alternative 4, the risks discussed in Section 5.1.2.2.3 apply. To summarize the risks (for all the DOE/NV environmental restoration sites), the highest risk is in traffic fatalities and injuries. Both were calculated as less than one person being affected. Even if the environmental restoration projects were accelerated under this alternative, the risks would remain the same. These risks are based on the number of shipments and not on annual rate.

5.4.2.2.4 Other Transportation—Under Alternative 4, the impacts related to other transportation would be similar to those described under Alternative 1 in Section 5.1.2.2.4.

5.4.2.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.2.4 Geology and Soils. Impacts to geology and soils under Alternative 4 would be the same as those described for Alternative 1 in Section 5.1.2.4.

5.4.2.5 Hydrology. The potential impacts to hydrology under Alternative 4 are discussed in this section. The discussion is broken into two subsections: surface hydrology and groundwater.

5.4.2.5.1 Surface Hydrology—Impacts to surface hydrology as a result of Alternative 4 are the same as those described under Alternative 1 in Section 5.1.2.5.

5.4.2.5.2 Groundwater—Water demand, impacts, and productivity are the same for the Tonopah Test Range as those described under Alternative 3 and are not significantly different from those under Alternative 1. There would be no significant additive or subtractive impacts under Alternative 4.

5.4.2.6 Biological Resources. Under Alternative 4, the impacts to biological resources would be the same as those described under Alternative 1 in Section 5.1.2.6.

5.4.2.7 Air Quality. Under Alternative 4, the impacts to air quality would be the same as those described under Alternative 1 in Section 5.1.2.7.

5.4.2.8 Noise. Noise impacts as a result of Alternative 4 for the Environmental Restoration and Work for Others Programs would be the same as those described under Alternative 1 in Section 5.1.2.8. The only impact to noise as a result of Defense Program activities would be the periodic, short-term noise caused by artillery and explosive testing operations.

5.4.2.9 Visual Resources. Under Alternative 4, the only program anticipated to have impacts on visual resources at the Tonopah Test Range would be the Environmental Restoration Program. The impacts to visual resources would be the same as those described under Alternative 1 in Section 5.1.2.9.

5.4.2.10 Cultural Resources. Direct impacts to cultural resources include ground disturbing activities associated with new construction, and possible off-road vehicle travel. Direct impacts such as unauthorized artifact collecting and vandalism, may also occur.

Defense Program. Under Alternative 4, the impacts to cultural resources would include ground disturbing activities associated with off-road vehicle travel for the Smart Transportation Project and construction of the Climatic Test Operation Facility (Appendix A). Increased access may result in unauthorized artifact collecting.

Waste Management Program. Under Alternative 4, no waste management activities will occur at the

Tonopah Test Range. Therefore, cultural resources will not be affected.

Environmental Restoration Program. Under Alternative 4, direct impacts to archaeological resources from cleanup activities could include disturbance of sites found within the area of potential effect. Indirect impacts could result from increased visitation to the site area.

Work for Others Program. Treaty verification activities at the Tonopah Test Range would have no impact on cultural resources.

Site-Support Activities. Impacts resulting from site-support activities under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.2.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section addresses the American Indian cultural concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted by defense activities; however, overflights and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program—Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted because there are no actions planned.

Environmental Restoration Program—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because no activities are planned under this alternative.

Work for Others Program—Under Alternative 4, it is expected that American Indian cultural resources will be impacted by military training exercises and conventional weapons tests.

5.4.2.11 Occupational and Public Health and Safety. Under Alternative 4, the only activities that would be important to health and safety are associated with the Environmental Restoration Program. Defense Program activities are mostly discontinued. Table 5.4-12 summarizes the occupational and public health and safety impacts for the applicable Tonopah Test Range program areas under Alternative 4. None of the activities under Alternative 4 have a potential to impact public health and safety.

Defense Program. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.5 injuries and 0.0044 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are projected as a result of routine program activities.

Based on previous occupational radiation periods, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 6 person-rem in 10-years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0025 latent cancer fatalities and 0.001 other detrimental health effects in the worker population.

The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect.

The health and safety impact to the public from potential Defense Program accidents at Tonopah

Test Range could result in about 9.0×10^{-9} latent cancer fatalities and 4.1×10^{-9} other detrimental health effects in the population. Additional risk due to accidental exposure to hazardous chemicals would be even less.

The maximum reasonably foreseeable Defense Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} [1 in 10,000,000] per year).

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident also would be the same as described in Section 5.1.2.11 for Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} [1 in 170,000] per year).

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities are expected to result in 0.0049 injuries and 0.001 fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Tonopah Test Range Environmental Restoration Program workers of about 0.6-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 2.4×10^{-4} latent cancer fatalities and 9.6×10^{-5} other detrimental health effects in the worker population.

The risk of accidental exposure to radioactive releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect. No Environmental Restoration Program hazardous chemical accident resulting in measurable effects at the Tonopah Test Range has been identified.

The health and safety impact to the public from potential Environmental Restoration Program accidents at Tonopah Test Range could result in about 1.2×10^{-9} latent cancer fatalities and 5.7×10^{-10} other detrimental health effects in the population. The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1×10^{-6} [1 in 1,000,000] per year).

5.4.2.12 Environmental Justice. Environmental Justice impacts for the region of influence are the same as those described in Section 5.4.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.2.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present and future activities on the Tonopah Test Range have, are, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.4.3 Project Shoal Area

Under Alternative 4, activities at the Project Shoal Area would be limited to Environmental Restoration Program activities; therefore, it is the only program discussed in this section. Activities

Table 5.4-12. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.5	0.0044	0.0025	0.001	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-8}	1×10^{-10}	9.7×10^{-7}
Environmental Restoration	0.0049	9.7×10^{-4}	2.4×10^{-4}	9.5×10^{-5}	e	e	1.2×10^{-9}	5.7×10^{-10}	e	e
Total	**2.5**	**0.0054**	**0.0027**	**0.0011**	**8.4×10^{-12}**	**1.8×10^{-5}**	**1×10^{-8}**	**4.7×10^{-9}**	**1×10^{-10}**	**9.7×10^{-7}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.

include continuation of characterization and remediation actions at the Project Shoal Area.

5.4.3.1 Land Use. Under Alternative 4, the impacts expected at the project area would be the same as under Alternative 1. Continued site characterization and long-term hydrologic monitoring could result in the disturbance of 10 acres of land. The 10 acres identified for Environmental Restoration Program activities would represent less than 0.4 percent of the project land area. Adverse impacts from Environmental Restoration Program activities to land-use resources would be negligible.

5.4.3.1.1 Site-Support Activities—Impacts resulting from Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.3.1.1.

5.4.3.1.2 Airspace—Under Alternative 4, impacts to airspace would be the same as those described under Alternative 1 in Section 5.1.3.1.2.

5.4.3.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of radioactive materials and waste, and other transportation.

5.4.3.2.1 On-Site Traffic—Environmental Restoration Program activities would be short-term and would require relatively few personnel (less than 10 people at any given time). No public roads currently exist on the site. Minor vehicular traffic is anticipated, but no traffic impacts are expected.

5.4.3.2.2 Off-Site Traffic—Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). In 1993, the average daily traffic on U.S. Highway 50 near the site amounted to 1,340 vehicles (NDOT, 1993); this traffic volume is far below the capacity of U.S. Highway 50 at this location. Therefore, under Alternative 4, there would be no traffic impacts on off-site roadways.

5.4.3.2.3 Transportation of Materials and Waste—Under Alternative 4, the risks discussed in Section 5.1.3.2.3 apply. The highest risk from environmental restoration activities would be in traffic fatalities and injuries. Both were calculated as less than one person being affected. Even if the environmental restoration activities were accelerated under this alternative, the risks would remain the same. These risks are based on shipments and not an annual rate.

5.4.3.2.4 Other Transportation—Because Alternative 4 would not include direct use of local railroads, air transportation, or other modes of transportation to the Project Shoal Area, direct effects on rail, air, and other modes of air transportation are expected to be minimal.

5.4.3.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.3.4 Geology and Soils. The Project Shoal Area would be used for any of the described expanded uses, so the potential impacts to the geology and soils would be the same as described under Alternative 1 in Section 5.1.3.4.

5.4.3.5 Hydrology. Under Alternative 4, the impacts to surface water and groundwater would be the same as those described under Alternative 1 in Section 5.1.3.5. Acceleration of the schedule would not significantly impact water demand.

5.4.3.6 Biological Resources. The impacts to biological resources under Alternative 4 would be very similar to those described under Alternative 1 in Section 5.1.3.6.

5.4.3.7 Air Quality. Under Alternative 4, the impacts to air quality would be the same as those described under Alternative 1 in Section 5.1.3.7.

5.4.3.8 Noise. Noise impacts as a result of Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.3.8.

5.4.3.9 Visual Resources. Under Alternative 4, impacts to visual resources would be the same as described under Alternative 1 in Section 5.1.3.9.

5.4.3.10 Cultural Resources. Impacts to cultural resources under Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.3.10.

AMERICAN INDIAN CULTURAL RESOURCES— This section describes the American Indian concerns associated with implementing Alternative 4 as summarized by the CGTO.

This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

NOTE: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.4.3.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only program expected to result in health and safety impacts to workers at the Project Shoal Area under Alternative 4. No contamination has been detected in surficial soils at this site, and no surface soil remedial actions are proposed. Activities at this site would consist of characterization and hydrologic monitoring. Alternative 4 would accelerate the program activities described under Alternative 1. For Project Shoal workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.4-13 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 4.

As under Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 4. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed under Alternative 1 in Section 5.1.3.11.

Environmental Restoration. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Project Shoal Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same time period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Project Shoal Area Environmental Restoration Program workers of about 0.04-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population.

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area have been identified.

5.4.3.12 Environmental Justice. Environmental Justice impacts for the region of influence would be the same as those discussed in Section 5.4.1.12.

The American Indian response regarding Environmental Justice is discussed in Section 4.1.12. American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. There has been no systematic study of these issues for the Project Shoal Area site.

This study area is not within the traditional lands of the American Indian people represented by the Consolidated Group of Tribes and Organizations. It is recommended by the CGTO that the DOE NTS EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

5.4.4 Central Nevada Test Area

Under Alternative 4, the programs at the Central Nevada Test Area would be limited to the Environmental Restoration Program; therefore, the only impacts discussed in this section are the results of that program. Activities would include continuation of characterization and remediation actions at the Central Nevada Test Area.

5.4.4.1 Land Use. Under Alternative 4, the impacts expected at the Central Nevada Test Area would be the same as under Alternative 1. Acceleration of activities and more stringent cleanup requirements would impact the schedule, but impacts to land use are not expected.

5.4.4.1.1 Site-Support Activities—No significant impacts on site-support activities would occur as a result of Alternative 4 actions. Requirements for water, power, and other facilities would not be increased over Alternative 1.

5.4.4.1.2 Airspace—There would be minimal effects on airspace at the Central Nevada Test Area as a result of Alternative 4.

5.4.4.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.4.2.1 On-Site Traffic—Environmental Restoration Program activities would be short term and would require relatively few personnel (less than 10 at any given time). There are no public roads currently on the site, and the low level of personnel anticipated would generate a minor amount of traffic. No public roads currently exist on the Central Nevada Test Area.

5.4.4.2.2 Off-Site Traffic—Under Alternative 4, there would be minor vehicular traffic generated. No traffic impacts are expected on off-site road ways. The impacts would be the same as those described under Alternative 1 in Section 5.1.4.2.2.

5.4.4.2.3 Transportation of Materials and Waste—Under Alternative 4, the risks discussed in Section 5.1.4.2.3 apply. Even if the Environmental Restoration Program activities were accelerated under this alternative, the risks would remain the same. These risks are based on the number of shipments and not on an annual rate.

5.4.4.2.4 Other Transportation—Because Alternative 4 activities do not include direct use of local railroads, air transportation, or other modes of transportation to this site, direct effects on rail, air, and other modes of transportation are expected to be minimal.

5.4.4.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work; therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included under Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.4.4 Geology and Soils. The Central Nevada Test Area would not be used for any of the described expanded uses, so the potential impacts to geology and soils would be the same as described under Alternative 1 in Section 5.1.4.4.

5.4.4.5 Hydrology. Under Alternative 4, the impacts to surface water and groundwater would be the same as those described under Alternative 1 in Section 5.1.3.5. Acceleration of the activities would not significantly impact water demand.

Table 5.4-13. Health risks to workers and the public from program activities, Project Shoal Area, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	6.8×10^{-5}	c	c	d	d	c	c
Total	**1.6×10^{-4}**	**3.1×10^{-5}**	**1.7×10^{-5}**	**6.8×10^{-4}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

5.4.4.6 Biological Resources. The impacts to biological resources under Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.4.6.

5.4.4.7 Air Quality. Under Alternative 4, the impacts to air quality would be the same as those described for Alternative 1 in Section 5.1.4.7.

5.4.4.8 Noise. Noise impacts as a result of Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.4.8.

5.4.4.9 Visual Resources. Under Alternative 4, impacts to visual resources would be the same as those described under Alternative 1 in Section 5.1.4.9.

5.4.4.10 Cultural Resources. Under Alternative 4, impacts to cultural resources would be the same as those described under Alternative 1 in Section 5.1.4.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Waste Management Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Environmental Restoration Program—Under Alternative 4, it is expected that American Indian cultural resources on the Central Nevada Test Area will be impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

5.4.4.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Central Nevada Test Area under Alternative 4. Activities at this site would consist of site characterization and remediation with removal of contaminated mud and sludge. Alternative 4 accelerates the program activities described under Alternative 1. For Central Nevada Test Area workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.4-14 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 4.

As in Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 4. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed under Alternative 1 in Section 5.1.4.11.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Central Nevada Test Area are expected to result in 1.6×10^{-3} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Central Nevada Test Area Environmental Restoration Program workers of about 0.04-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-5} other detrimental health effects in the worker population.

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Central Nevada Test Area have been identified.

5.4.4.12 Environmental Justice. Environmental Justice impacts for the region of influence would be the same as those discussed in Section 5.4.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.4.4.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present, and future activities on the Central Nevada Test Area have, are, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impact. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to resolve past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.1.2 and are not repeated here.

5.4.5 Eldorado Valley

Under Alternative 4, the only program expected to occur in Eldorado Valley is the Nondefense Research and Development Program; therefore, the impacts discussed in this section are limited to that program. A sitewide EIS, supplemental EIS, and or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

5.4.5.1 Land Use. The location of a Solar Enterprise Zone facility in Eldorado Valley would not result in significant impacts on land uses under Alternative 4. The designation of the site for renewable energy development is consistent with the plans for a tortoise preserve and other uses for the annexed land. Boulder City has already designated 6,000 acres of the land annexed for the purpose of renewable resource development. This designation is consistent with the location of a Solar Enterprise Zone facility in Eldorado Valley.

A Solar Enterprise Zone facility at this site, under Alternative 4, would have the same impacts as described under Alternative 3 in Section 5.3.5.1.

5.4.5.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.5.2.1 On-Site Traffic—Impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.5.2.1.

5.4.5.2.2 Off-Site Traffic—Under Alternative 4, impacts would be the same as those described under Alternative 3 in Section 5.3.5.2.2.

5.4.5.2.3 Transportation of Materials and Waste—This section is not applicable to the Eldorado Valley Solar Enterprise Zone site.

5.4.5.2.4 Other Transportation—Because this alternative does not assume extensive transportation of personnel and materials via rail or air, impacts to these transportation modes would be minimal and would not be significant.

5.4.5.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analyses for this site is included in Section 5.4.1.3.

Table 5.4-14. Health risks to workers and the public from program activities, Central Nevada Test Area, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	6.8×10^{-5}	c	c	d	d	c	c
Total	**1.6×10^{-4}**	**3.1×10^{-5}**	**1.7×10^{-5}**	**6.8×10^{-5}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.5.4 Geology and Soils. Impacts on the geologic resources and soils of Eldorado Valley, as a result of developing a Solar Enterprise Zone facility would be the same under Alternative 4 as under Alternative 3 and are described in Section 5.3.5.4.

5.4.5.5 Hydrology. Surface water and groundwater impacts under Alternative 4 would be the same for Eldorado Valley as Alternative 3. There would be no significant impacts under Alternative 4, as described in Section 5.3.5.5.

5.4.5.6 Biological Resources. The impacts at this site under Alternative 4 would be the same as those under Alternative 3, as described in Section 5.3.5.6.

5.4.5.7 Air Quality. Under Alternative 4, impacts to air quality would be the same as those described under Alternative 3 in Section 5.3.5.7.

5.4.5.8 Noise. Noise impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.5.8.

5.4.5.9 Visual Resources. The impacts on the visual resources of Eldorado Valley under Alternative 4 would be the same as those under Alternative 3, as described in Section 5.3.5.9.

5.4.5.10 Cultural Resources. Under Alternative 4, impacts to cultural resources would be the same as those described under Alternative 1 in Section 5.1.1.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Eldorado Valley.

Waste Management Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Eldorado Valley.

Environmental Restoration Program—Under Alternative 4, no environmental restoration activities are planned for Eldorado Valley; therefore, no adverse impacts to American Indian resources are expected.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

5.4.5.11 Occupational and Public Health and Safety. Minimal occupational health and safety impacts are expected as a result of construction and operation of a Solar Enterprise Zone facility. All activities at the site would be conducted in compliance with Occupational Safety and Health Administration regulations and requirements.

5.4.5.12 Environmental Justice. Environmental Justice impacts in the region of influence would be the same as those described in Section 5.4.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.5.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have disproportionately impacted the American Indian people, especially regarding Holy Land violations. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.4.6 Dry Lake Valley

Activities at Dry Lake Valley are limited to the Nondefense and Research Program; therefore, impacts discussed in this section would be the result of Nondefense and Research Program activities. A sitewide environmental impact statement, supplemental environmental impact statement, and or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

5.4.6.1 Land Use. The location of a Solar Enterprise Zone facility in Dry Lake Valley would not result in significant impacts on land uses under Alternative 4. The designation of the site for renewable energy development is consistent with the plans for energy production in this area.

The impacts to airspace under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.6.1.

5.4.6.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.6.2.1 On-Site Traffic—Impacts would be the same as described under Alternative 3, Section 5.3.6.2.1.

5.4.6.2.2 Off-Site Traffic—U.S. Highway 93 would be the major regional access to the site. It is a two-lane, two-way rural highway with 1,210 average daily traffic in 1993 south of State Route 375 Junction. The projected peak hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.4-4. With the Solar Enterprise Zone facility in operation, U.S. Highway 93 near the site would continue to operate at level of service C or better.

5.4.6.2.3 Transportation of Materials and Waste—Transportation of materials and waste are not expected to occur at a Solar Enterprise Zone facility. Therefore, this section is not applicable to this site.

5.4.6.2.4 Other Transportation—Because activities under Alternative 4 do not include extensive rail or air transportation of personnel and materials, impacts to these transportation modes would be minimal and would not be significant.

5.4.6.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analyses for this site is included in Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3

5.4.6.4 Geology and Soils. Impacts on the geologic resources and soils of Dry Lake Valley as a result of the development of a Solar Enterprise Zone facility would be the same under Alternative 4 as under Alternative 3 in Section 5.3.6.4.

5.4.6.5 Hydrology. Surface water and groundwater impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.6.5.

5.4.6.6 Biological Resources. The impacts to biological resources at this site under Alternative 4 would be the same as under Alternative 3, as described in Section 5.3.6.6.

5.4.6.7 Air Quality. Impacts to air quality would be the same as those described under Alternative 3 in Section 5.3.6.7.

5.4.6.8 Noise. Noise impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.6.8.

5.4.6.9 Visual Resources. The impacts on the visual resources of Dry Lake Valley under Alternative 4 would be the same those under Alternative 3, as described in Section 5.3.6.9.

5.4.6.10 Cultural Resources. Under Alternative 4, impacts to cultural resources at Dry Lake Valley would be the same as those described for Alternative 3 in Section 5.3.6.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Dry Lake Valley.

Waste Management Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Dry Lake Valley.

Environmental Restoration Program—No environmental restoration activities are planned for Dry Lake Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 4.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Dry Lake Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

5.4.6.11 Occupational and Public Health and Safety. Minimal occupational health and safety impacts are expected as a result of construction and operation of a Solar Enterprise Zone facility. All activities at the site would be conducted in compliance with Occupational Safety and Health Administration regulations and requirements.

5.4.6.12 Environmental Justice. Environmental Justice impacts for the region of influence would be the same as those discussed in Section 5.4.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.6.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Dry Lake Valley have disproportionately impacted these American Indian people especially regarding Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.4.7 Coyote Spring Valley

Under Alternative 4, the Nondefense Research and Development Program would be the only program conducting activities; therefore, the impacts discussed in this section are limited to Nondefense Research and Development Program activities. A sitewide EIS, supplemental EIS, and or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

5.4.7.1 Land Use. Under Alternative 4, alternative energy projects would be located as approved. Alternative 4 actions would not significantly impact surrounding land uses, which include wildlife management, mining, and recreation.

Under Alternative 4, impacts to airspace would be the same as those described under Alternative 3 in Section 5.3.7.1.2.

5.4.7.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.7.2.1 On-Site Traffic—Impacts to on-site traffic under alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.2.1.

5.4.7.2.2 Off-Site Traffic—Impacts to off-site traffic would be the same as those described under Alternative 3 in Section 5.3.7.2.2.

5.4.7.2.3 Transportation of Materials and Waste—Transportation of materials and waste are not expected at the Solar Enterprise Zone facility. Therefore, this section is not applicable to this site.

5.4.7.2.4 Other Transportation—Because this alternative's activities do not include extensive rail or air transportation of personnel and materials, impacts to these transportation modes would be minimal and would not be significant.

5.4.7.3 Socioeconomics. A major objective of the Solar Enterprise Zone facility in Coyote Spring Valley is to provide local employment and economic benefits to offset the impact of defense conversion and Alternative 4 activities on the NTS. A Solar Enterprise Zone facility would stimulate the economy of Coyote Spring Valley and Lincoln County, while simultaneously serving national energy and environmental objectives. Building individual solar projects would provide construction jobs for a short period of time, while a fairly small, stable work force would be required for sustained operation and maintenance of the facilities.

Solar energy could fill the increased demand for electricity without damaging the environment. The development of a new science and manufacturing base mission is important. At the same time, environmental concerns create a growing demand for alternative generating technologies.

The socioeconomic impacts of the Solar Enterprise Zone facility will be presented when more information with respect to economic activity, population, housing, public finance, and public services is available. A sitewide EIS, supplemental EIS, and/or other environmental studies will be performed to describe all socioeconomic impacts. In addition, project plans, site preparation, technical studies, and worker-transition training development and implementation could be accomplished.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in 5.1.1.3.

5.4.7.4 Geology and Soils. There would be the same impacts on the geologic resources and soils of Coyote Spring Valley as a result of the development of a Solar Enterprise Zone under Alternative 4 as under Alternative 3. Impacts under Alternative 3 are described in Section 5.3.7.4.

5.4.7.5 Hydrology. Surface water and groundwater impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.5.

5.4.7.6 Biological Resources. The impacts to biological resources activities at this site under Alternative 4 would be the same as under Alternative 3. These are described in Section 5.3.7.6.

5.4.7.7 Air Quality. Impacts to air quality under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.7.

5.4.7.8 Noise. Noise impacts under this alternative would be the same as those described under Alternative 3 in Section 5.3.7.8.

5.4.7.9 Visual Resources. The impacts to visual resources of Coyote Spring Valley under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.9.

5.4.7.10 Cultural Resources. Impacts to cultural resources would be the same as those described under Alternative 3 in Section 5.3.7.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Coyote Spring Valley.

Waste Management Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Coyote Spring Valley.

Environmental Restoration Program—No environmental restoration activities are planned for Coyote Spring Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 4.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Coyote Spring Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

5.4.7.11 Occupational and Public Health and Safety. Minimal occupational health and safety impacts are expected as a result of construction and operation of a Solar Enterprise Zone facility. All activities at the site would be conducted in compliance with Occupational Safety and Health Administration regulations and requirements.

5.4.7.12 Environmental Justice. The Environmental Justice impacts for the region of influence are the same as those discussed in Section 5.4.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Coyote Spring Valley The CGTO maintains that past activities in the Coyote Spring Valley have impacted these American Indian Environmental Justice issues, especially Holy Land violations. This area was traditional lands for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.5 Unavoidable Adverse Effects

Unavoidable impacts constitute a substantial adverse change to existing environmental conditions that cannot be fully mitigated by implementing mitigation measures. The potential unavoidable adverse impacts that could arise from implementing the alternatives discussed in Chapter 5 are summarized below. Under Alternatives 1, 2, 3, and 4, the unavoidable adverse impacts of past underground nuclear testing activities would remain.

5.5.1 Alternative 1

The unavoidable adverse effects that would result from implementing Alternative 1 are presented in the following sections.

5.5.1.1 Nevada Test Site. All continuing programs and operations at the NTS would produce some environmental impacts that are not mitigated. The unavoidable adverse effects at the NTS are presented in this section.

UNDERGROUND TESTING—First and foremost among the unavoidable adverse effects are the impacts resulting from underground testing, both in terms of the magnitude of the impacts and their duration. As noted in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977), other activities conducted

at the NTS "for the most part are registered immediately and those effects are very small in comparison with the effects of underground nuclear testing." Under Alternative 1, the DOE would maintain the readiness and capability to conduct one or more underground nuclear weapons tests, if directed by the President, within the 10-year timeframe.

The major unavoidable effects of underground testing include the release of large quantities of radioactivity into the subsurface, the formation of new subsidence craters, and the generation of ground motion that might be felt outside the boundaries of the NTS.

The underground nuclear tests conducted under Alternative 1 would contaminate the subsurface with a large amount of short- and long-lived radionuclides. As discussed in Section 4.1.2, approximately 45,000 Ci/kt would remain in the subsurface 180 days after a test. The types of radionuclides produced are further discussed in Section 4.1.5.2, with tritium likely to be the most abundant radionuclide. Many of the other radionuclides would remain bound up in the melt glass in the event cavity. Some groundwater might be unavoidably contaminated if the shot cavity is below or intercepts the water table. The surface areas below which the contaminants are released are strictly controlled for safety and security reasons.

An underground nuclear test would also unavoidably disrupt the integrity of the subsurface geologic environment. Contamination might extend as far as five times the radii of the cavity from the shot point. Following the tests, subsidence craters often form because of the collapse of the geologic units. These impacts preclude the use of the geologic values inherent at the site for the long term. Subsidence craters alter the natural surface drainage and might locally increase soil erosion. Preferential drainage from subsidence craters down the rubble chimney to the shot cavity might occur and might contaminate the groundwater as a result, although little data exist to determine whether this is the case.

Ground motions accompanying underground nuclear explosions and some other tests conducted at the NTS are felt in Las Vegas, Nevada, and elsewhere in the surrounding region. Occasionally, ground motion from a larger test might cause nonstructural off-site damage, such as plaster cracks. A larger underground test could cause perceptible motion at off-site locations, particularly in high-rise structures in Las Vegas.

SUBCRITICAL EXPERIMENTS—Underground subcritical experiments would produce some physical effects on the geologic media. Approximately 2,314 m^3 (81,700 ft^3) would be disturbed each year in association with the conduct of up to four experiments. Irreversible effects would include the deposition of radiological material within and near the cavity mined in the subsurface. Approximately 20 acres of surface geologic media are currently disturbed in association with the Lyner Complex, where these experiments would be conducted.

LAND USE—Land uses would continue to be restricted at the underground test areas and at the radioactive waste management sites because of subsurface contamination and the presence of landfilled wastes, respectively. Revegetation of the surfaces as sections of the radioactive waste management sites are closed would create stable soils and better habitat. Decommissioning of some contaminated facilities would result in their demolition. If the facility is of historic significance, as many of them are, the loss of the structure would represent an unavoidable adverse impact. The loss would be partially mitigated by data gathered in accordance with the documentation requirements of the Historical American Buildings Survey/ Historical Engineering Records system of the National Park Service.

Airspace restrictions would continue to prohibit commercial and general aviation use. Because the NTS airspace is nearly surrounded by NAFR Complex restricted airspace, the added increment of limitation would be minor.

TRANSPORTATION—Vehicular traffic at the NTS would continue at about 1,890 average daily trips, while off-site trips would continue at a rate of about 2,480. The contribution of NTS-related traffic to the Las Vegas area's already unsatisfactory

level of service on major roadways would be minimal. Though a small increment in emissions would not cause additional violations, mobile-source emissions would continue to contribute to the Las Vegas Valley's sometimes poor air quality.

GEOLOGY AND SOILS—The impact to geology and soils is presented in the discussion of the underground testing effects.

HYDROLOGY—The impacts to hydrology are discussed in the underground testing effects section.

BIOLOGICAL RESOURCES—Surface disturbance associated with remediation, construction, and testing programs would cause unavoidable impacts on habitat. Surface-disturbing activities may kill or displace wildlife such as small mammals, reptiles, and soil-dwelling invertebrates. If ground clearing for construction occurs during the breeding season, the eggs of birds in nests on the ground within a project area may be destroyed. Despite attempts to find and relocate desert tortoises before events occur that could threaten them, some tortoises, particularly juveniles, might be missed and could be killed by heavy equipment or vehicles. Training exercises that take place in desert tortoise habitat could result in tortoise mortality. Normal road traffic on the NTS has resulted in less than one tortoise mortality per year. This rate would be anticipated to continue. Wildfires in tortoise habitat would also constitute a source of potential tortoise mortality.

Sumps at the underground test area wells and open containers at the proposed Liquid Waste Treatment System Facility might attract some birds, bats, or mammals and cause their deaths through drowning or contamination. Although not studied, it is likely that losses would be very small. Developed areas of the NTS that have buildings, roads, storage lots, sewage lagoons, and other infrastructure would remain unavailable for natural habitat.

AIR QUALITY—Certain activities would produce PM_{10} and mobile-source emissions. Particulate matter less than 10 microns (PM_{10}) would be produced through surface disturbance. Particulates would not threaten Nye County's attainment, however, and would only contribute 0.03 percent of the County's total. Similarly, the PM_{10} contribution to Clark County's total would be very small.

VISUAL RESOURCES—Developed areas of the NTS that have buildings, roads, storage lots, sewage lagoons, and other infrastructure would continue in many cases to affect the viewshed. Project areas are initially accessed by graded gravel or dirt roads. If the projects become long-term, these roads would require upgrading, which would have increased impacts on habitat and visual resources.

CULTURAL RESOURCES—If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, then these resources may be lost when remediation disturbs the surface. This is an unavoidable impact. Impacts resulting from the illicit collection of artifacts by NTS workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY—Preparations for activities, such as the Big Explosives Experimental Facility and radioactive waste management sites, would result in new surface disturbances. Similarly, Environmental Restoration Program activities would disturb surface areas during the process of remediating industrial sites, plutonium-contaminated soils, Defense Nuclear Agency sites, and during the preparation of well pads for groundwater characterization. Approximately 1,890 acres on the NTS and 1,169 acres on the NAFR Complex would be affected. It should be noted, however, that the restoration of contaminated areas represents the mitigation of impacts that have resulted from past actions at the NTS. Thus, the unavoidable negative impacts associated with these actions would be counterbalanced by the reduction in the risk to human health caused by the contamination.

NOISE—While there would be no off-site impacts, temporary high noise levels would prevail in the proximity of operations like the Spill Test Facility, drilling operations, and the Big Explosives Experimental Facility during detonations.

5.5.1.2 Tonopah Test Range. Remediation of the environmental restoration sites and the Soils

Media Corrective Action Unit areas would result in removal of the vegetation and surface soil layers. This would produce PM_{10} at about 27 kilograms (kg) (60 pounds [lb]) per acre per year. Particulates and mobile-source emissions represent a minor degradation of the air quality. Vegetation and some animals would be destroyed, but no population's viability would be threatened. Visual resources would be unavoidably altered. Removal of vegetation and disturbed soils that differ from the surroundings in color or tone would become visually evident until revegetation had progressed. In some cases, however, vegetation types might be substantially different from that in surrounding areas if rehabilitation with local native species is unsuccessful. The change in species could produce areas that differ in color, tone, or texture from the surroundings. Since these areas are not located where they can be observed from public viewpoints and are classified as common scenery, the effects to visual resources would be minor.

GEOLOGY AND HYDROLOGY—Grading of the surface for restoration of the Soils Media Corrective Action Unit sites would cause some minor alteration of surface-water drainage patterns and some accelerated erosion until stabilization occurred. Minor use of groundwater for dust control and revegetation of the Soils Media Corrective Action Unit sites would be an unavoidable, but minor, impact.

NOISE—Local noise from heavy equipment and drill rigs would be an unavoidable, but minor, impact.

CULTURAL RESOURCES—In some cases, contamination levels might pose an unacceptable high risk to archeological surveyors. Any cultural resources in these areas would be lost to surface disturbance during remediations. The necessity of removing cultural resource materials that would otherwise be destroyed by remediation activities would represent a benefit to the present knowledge base. However, data recovered represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies.

5.5.1.3 Project Shoal and Central Nevada Test Areas. Monitoring, characterization, and minor remediation would result in very limited surface disturbance, totaling about 54 acres. This would result from well drilling, minor excavation, and backfilling of the Project Shoal area emplacement shaft. Small amounts of PM_{10} and mobile-source emissions would be produced. Heavy equipment and drill rig operations would produce sporadic local noise.

Remediation activities might require data recovery from some cultural resource sites. Removing cultural resource materials that would otherwise be destroyed by these activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Impacts resulting from the illicit collection of artifacts by workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

Geologic media contaminated by the test would remain contaminated and would be unavailable for other uses. Groundwater in the vicinity of the shot cavity at each test area might be contaminated and, if so, would remain unavailable for any use.

5.5.2 Alternative 2

The unavoidable adverse effects resulting from implementation of Alternative 2 are discussed in the following sections.

5.5.2.1 Nevada Test Site. Closure of operations at the NTS would produce some environmental impacts that could not be mitigated, but significantly fewer than those under Alternative 1. Areas developed with buildings, roads, storage lots, sewage lagoons, and other infrastructure, except as slowly modified by deterioration, would remain unavailable for natural habitat and would continue to affect the viewshed in many cases. There would be minor production of PM_{10} from operations at the radioactive waste management sites as they finish operations and close, and from security patrols on unpaved roads. Monitoring and patrols would

produce minor mobile-source emissions. These would be reduced when compared to Alternative 1. The facilities would no longer contribute to research and development, training, and employment levels.

Deterioration of unmaintained facilities and infrastructure would result in a need for major repairs or demolition and reconstruction if the site were to be reactivated at some future time.

Closure of the NTS would result in unavoidable adverse impacts to the regional socioeconomic conditions, including the loss of a substantial number of relatively high-paying jobs, increases in unemployment rates, loss of economic diversification, and out-migration of DOE and contractor employees and their families. These adverse effects would be relatively short term. Unrelated and economic community growth would be expected to overshadow these effects in time.

Preparations for closure activities at the radioactive waste management sites would result in minor new surface disturbances. At those sites where action would be necessary because of hazard or monitoring requirements, the Environmental Restoration Program would disturb some surface areas in the process of stabilizing or remediating industrial sites and Defense Nuclear Agency sites and in the preparation of well pads for groundwater monitoring. The total disturbance would be considerably less than with Alternative 1.

Subsurface contamination from historic underground nuclear tests would continue to restrict access to the underground zone surrounding the expended test for reasons of safety and security. The presence of subsidence craters would result in alteration of surface drainages and increased soil erosion. Most of the radionuclides are thought to be bound up in the melt glass surrounding the shot cavity. However, some groundwater would be unavoidably contaminated if the shot cavity was below, or intercepted, the water table. Preferential drainage from subsidence craters down the rubble chimney might occur and might contaminate the groundwater. The underground effects of this alternative vary little from those in Alternative 1 except that there would be no remediation of the underground testing areas other than possible long-term institutional controls.

Surface disturbances have caused unavoidable impacts on habitat that would not be restored under Alternative 2. Normal road traffic at the NTS has resulted in less than one tortoise mortality per year. This rate would be anticipated to decline with the decreased road traffic under Alternative 2. Wildfires in tortoise habitat would also constitute a source of potential tortoise mortality.

Shutdown of some wells would result in drying up of associated sumps that are presently perennial water sources. Wildlife that is dependent upon these sources and unable to relocate would be unavoidably lost.

Sumps at Underground Test Area wells would be temporarily wet during sampling activities and might attract some birds, bats, or mammals and cause their deaths through drowning or contamination.

Under Alternative 2, on-site average daily trips at the NTS would decrease by 1,868, while off-site trips would decrease by 760 in 1996, and by 1,440 in 2000 and 2005. The contribution of NTS-related traffic to the Las Vegas area's already unsatisfactory level of service on major roadways would be minimal. Though a small increment that would not cause additional violations, mobile-source emissions would continue to contribute to the Las Vegas Valley's sometimes poor air quality.

The NAFR Complex airspace restrictions would continue to prohibit commercial and general aviation use. Since the NTS airspace is nearly surrounded by NAFR Complex restricted airspace, the added increment of limitation would be minor.

Since the site would be locked up, the NTS would be unavailable for most human-oriented land use. Natural recovery would slowly progress, and ecosystems would begin to approach an equilibrium largely unaffected by humans.

Impacts resulting from the illicit collection of artifacts by workers may be partially mitigated through education, but it is likely that some workers

would persist in such activities. This would be an unavoidable impact.

*5.5.2.2 **Tonopah Test Range***. No Environmental Restoration Program projects would occur except at those sites that present an immediately hazardous situation. This would result in no change to present land use. Presently, applicable land-use restrictions would continue to limit the types of access and activities for which these lands could be used.

Affected soils would remain unavoidably contaminated, thereby restricting their use and potentially reducing their productive capacity. Under certain conditions, it would be possible for surface water to transport contamination to other areas and become contaminated itself. Similarly, under certain uncommon conditions, it would be possible for air to suspend and transport contamination to other areas.

*5.5.2.3 **Project Shoal and Central Nevada Test Areas***. Geologic media contaminated by each of the tests would remain so and would be unavailable for other use. Groundwater in the vicinity of each shot cavity might be contaminated and, if so, would remain unavailable for any use. A contaminated mud pit at the Central Nevada Test Area would not be remediated.

5.5.3 Alternative 3

The unavoidable adverse effects resulting from implementation of Alternative 3 are discussed in the following sections.

*5.5.3.1 **Nevada Test Site***. The unavoidable adverse environmental impacts addressed in this alternative would include those discussed for Alternative 1, as well as additional ones. New projects, which would include a facility for handling and storing weapons-usable fissile materials; expansion of the Device Assembly Facility; and a large, heavy-industrial facility, would increase the amount of land committed to other land use. Some additional disposal area would result from increased disposal of low-level waste, mixed waste, and sanitary waste. Since this disposal would occur within the boundaries of the sites already designated for waste disposal, it would not represent a significant new commitment of land use.

No specific location has been proposed for some of these projects, so it is not possible to identify impacts precisely. Therefore, a range of potential impacts is discussed in terms of how these differ from the impacts in Alternative 1.

Visual impacts would vary with location, but would generally be negligible because most of the NTS is not visible from public viewpoints, and much of the site has scenery common to the region.

An added increment of air contaminants would result both from construction and operations. The effect of one or more underground nuclear tests would be the same as under Alternative 1.

Most of the additional projects proposed would affect relatively limited surface areas. The notable exception would be the alternative energy proposal. Depending upon the technology or technologies pursued, the solar energy projects could affect up to 2,400 acres. If located in habitats containing plants of limited distribution, the viability of the population could be threatened. Increased road traffic, in addition to habitat destruction and crushing because of construction activity, would result in increased tortoise mortality. The overall doubling of traffic on the NTS would likely produce tortoise mortality of about two per year.

Increased groundwater pumping at the NTS might have the potential to reduce discharge at regional springs such as Devils Hole and Ash Meadows. Devils Hole harbors a population of pupfish, which is very sensitive to falling water levels. Ash Meadows has a great number of sensitive species of fish, invertebrates, and plants dependent upon its springs.

Project areas would initially be accessed by graded gravel or dirt roads. Traffic impacts resulting from the construction of new facilities would peak during the construction phase. If the projects become long term, these roads would require upgrading that would create additional visual, erosional, and habitat impacts.

Average daily trips on the NTS would be about 13,300, an increase of 11,400 over Alternative 1. Additional off-site average daily trips over Alternative 1 would range from 210 in 1996 to a high of 1,520 in 2000. This would not cause any air-quality violations. The increased traffic would add a small increment to the Las Vegas area's freeways and arterials, which are anticipated to be at unacceptable levels of service without any NTS activity. This would also add a small increment of pollution to the sometimes poor air quality of the Las Vegas Valley.

Because of the presence of a doubled workforce, an increase in vandalism to cultural resource sites would occur. Despite efforts to control workers' impacts on cultural resources by training, site avoidance through relocation of activities, or data recovery, some individuals would persist in vandalizing sites. This is, to some degree, an unavoidable impact.

Decommissioning of some contaminated facilities would result in their demolition. If the facility is of historic significance, as many of them are, the loss of the structure would represent an unavoidable adverse impact. The loss would be partially mitigated by data gathered in accordance with the documentation requirements of the Historical American Buildings Survey/Historical American Engineering Records system of the National Park Service.

If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, then these resources may be lost when remediation disturbs the surface. This is an unavoidable impact. Impacts resulting from the illicit collection of artifacts by NTS workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

5.5.3.2 Tonopah Test Range. Risk to the public would remain the same as that discussed under Alternative 1.

Remediation of the Environmental Restoration Program sites and the Soils Media Corrective Action Unit areas would unavoidably result in removal of the vegetation and surface soil layers. This would produce PM_{10} at a rate of 27 kg (60 lb) per acre per year in the case of the Environmental Restoration Program sites. Particulates and mobile-source emissions would represent a degradation of air quality, though minor in this case. Vegetation and some animals would be destroyed, but no population's viability would be threatened. Visual resources would be unavoidably altered. Removal of vegetation and disturbance of soils that differ from the surroundings in color or tone would become visually evident until recovery had progressed. In some cases, however, vegetation types might be substantially different from that in surrounding areas if rehabilitation with local native species is unsuccessful. The change in species could produce areas that differ in color, tone, or texture from the surroundings. Since these areas are not located where they can be observed from public viewpoints and are classified as common scenery, the effects to the visual resource would be minor. Grading of the surface for restoration of the Soils Media Corrective Action Unit sites would cause some minor alteration of surface-water drainage patterns and some accelerated erosion until stabilization occurred. Minor use of groundwater for dust control and revegetation of the Soils Media Corrective Action Unit sites would be an unavoidable, though minor impact.

Local production of noise from heavy equipment and drill rigs would be a minor impact.

The necessity of removing cultural resource materials that would otherwise be destroyed by remediation activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. In some cases, contamination levels might pose an unacceptably high risk to archeological surveyors. Any cultural resources in these areas would be lost to surface disturbance during remediation.

5.5.3.3 Project Shoal and Central Nevada Test Areas. Monitoring, characterization, and any minor remediation would result in very limited surface disturbance. This would result from well drilling, minor excavation, and backfilling of the Project

Shoal Area emplacement shaft. Small amounts of PM_{10} and mobile-source emissions would be produced. Heavy equipment and drill rig operation would produce temporary local noise. Drilling sumps would pose a minor threat to some animals. The level of habitat recovery would depend upon the degree to which native plants could be reestablished.

Remediation activities might require data recovery from some cultural resource sites. Removing cultural resource materials that would otherwise be destroyed by these activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies.

Geologic media contaminated by the test would remain contaminated and would be unavailable for other uses. Groundwater in the vicinity of the shot cavity might be contaminated and, if so, would remain unavailable for any use.

5.5.3.4 Eldorado Valley. Land used for this proposal is designated for renewable energy development and would be committed to a single use. Depending on where in Eldorado Valley the project is sited, existing land use would be affected to a greater or lesser degree. Some of the more intensive present uses of the playa are recreational, including land sailing, model aircraft flying, ultralight operations, off-highway vehicle use, and camping. Areas off the playa are used for bird hunting and off-highway vehicle races. All these uses would be incompatible within the area developed for solar generation; those uses that disturb the surface would probably be considered undesirable in the vicinity of collectors where they cause airborne particulates. The loss of these opportunities would be an unavoidable adverse impact.

Some power and natural gas line construction would be necessary. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and consequently would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites themselves. A total of up to 2,400 acres of habitat could be lost to project construction, and approximately 42 acres may be lost to power and pipe line construction. A similar amount of soils would be disturbed.

The site lies within the Class B airspace (Terminal Control Area) for McCarran International Airport. Glare from the collectors could affect aircraft operations. Should this occur, operations at the Solar Enterprise Zone facility would have to be altered to lessen the effect, which would adversely affect its production, or airport operations would have to be modified to avoid this conflict.

Although the scenery is common to the region, the site is viewed by large numbers of the public traveling Highway 95 and engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Study Areas within the site's viewshed. Construction of the solar facilities and associated infrastructure would create considerable change in the visual environment of the valley.

Surface disturbance and construction would result in the production of PM_{10} and mobile-source emissions. Local noise levels would be present during construction. Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.5.3.5 Dry Lake Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are used for occasional off-highway vehicle races. This use would be incompatible within the area developed for solar generation, and because it disturbs the surface, it would probably be considered undesirable in the vicinity of collectors because of airborne particulates. The loss of vehicle race opportunities would be an unavoidable adverse impact.

A limited amount of power and natural gas line construction would be necessary. A proposal exists to construct a water line to Coyote Spring Valley to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and consequently would affect gene-pool flow in less mobile species like tortoises. The water line has the potential to affect a large area of tortoise habitat in the area to the north along the west side of the Arrow Canyon Range. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites. A total of 2,400 acres of habitat could be lost to project construction, and approximately 560 acres may be lost to power and pipe line construction.

Depending on the quantity of water involved and the source of that water, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace.

The site lies within the Class B (Terminal Control Area) for McCarran International Airport and Nellis Air Force Base. Glare from the collectors could affect aircraft operations. In that event, either the solar facility would have to alter its operations to lessen the effect, which would adversely affect its production, or the airfields would have to modify their operations to avoid conflict.

Although the scenery is common to the region, the site is viewed by large numbers of the public traveling the highways and engaging in recreational pursuits. Construction of the solar facilities and associated infrastructure would have a large impact on the visual environment.

Surface disturbance and construction would result in the production of PM_{10} and mobile-source emissions. Local noise levels would be present during construction.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.5.3.6 Coyote Spring Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are lightly used for dispersed recreation. This use would be incompatible within the area developed for solar generation. The loss of the opportunities would be a minor unavoidable adverse impact.

Substantial power and natural gas line construction would be necessary. A water line would have to be constructed to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and consequently would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads, and on the construction sites. A total of 2,400 acres of habitat could be lost to project construction, and approximately 960 acres may be lost to power and pipe line construction. The habitat in Coyote Spring Valley has been designated by the U.S. Bureau of Land Management as critical habitat for the threatened desert tortoise. Specific project locations are necessary before a determination can be made regarding the potential to adversely affect any other sensitive species present in the valley.

Depending on the quantity of water involved, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace. The use of groundwater might also have the potential to affect local springs in the valley.

Scenic quality of the site has been designated Class B. The site is viewed by the public traveling U.S. Highway 93 and engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Study Areas within the site's viewshed. Construction activities of the solar facilities and associated infrastructure would greatly

change the landscape character of Coyote Spring Valley and have an adverse impact on the visual environment.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.5.4 Alternative 4

The unavoidable adverse effects resulting from the implementation of Alternative 4 are discussed in the following sections.

5.5.4.1 Nevada Test Site. Continued operations at the NTS, even without the Defense Program, would produce some environmental effects that remain unmitigated. Areas would remain developed in buildings, roads, storage lots, sewage lagoons, and other infrastructure, as in Alternative 1, and would be unavailable for natural habitat. In addition, development of a Solar Enterprise Zone facility would affect a land base of up to 2,400 acres. This may substantially increase the impact on public viewsheds as the solar site proposed for Area 22 may be visible from U.S. Highway 95. Increased public access for museum visits, road races, special hunts, and other recreation would make substantially more area of the NTS visible to increasing numbers of visitors, thus increasing the impact of existing or new development on visual resources. However, much of the scenery in the region is common. Some operations would produce PM_{10} and mobile-source emissions.

Underground test areas would unavoidably remain contaminated and result in continued restricted access to the subsurface. Construction sites and subsidence craters would result in altered surface drainage and increased soil erosion. Most of the radionuclides are thought to be bound up in the melt glass surrounding the shot cavity. However, some groundwater would be unavoidably contaminated when the shot cavity was below, or intercepted, the water table. Preferential drainage from craters down the rubble chimney might occur and might contaminate the groundwater as a result. There would not be the small additional increment of impact with this alternative as no further underground nuclear tests would occur.

Surface disturbance would cause unavoidable impacts on habitat. While no additional increment would ensue because of the Defense Program, a Solar Enterprise Zone facility would require a substantial acreage. If the Solar Enterprise Zone facility were located in an area that supports sensitive species, a threat to their viability would exist. Reduced habitat and increased risk of crushing during construction and on roads would unavoidably affect tortoises if the sites were located in their habitat. Increased groundwater use for the Solar Enterprise Zone efforts might adversely affect discharge at regional springs. Reductions at Devils Hole and Ash Meadows could have a large impact on the numerous sensitive species depending on the water levels and discharge rates.

Some mortality might occur to birds, bats, and other mammals through drowning or contamination at the Underground Test Area well sumps and open tanks at the Liquid Waste Treatment System Facility.

Particulate and mobile-source emissions would not threaten attainment in Nye County. They would not cause additional violations in Clark County, but would add a small increment to Clark County's existing air-quality problems.

Average daily trips offsite would fall by 330 relative to Alternative 1. This would cause an additional small increment to the unsatisfactory levels of service on key roadways in the Las Vegas Valley.

Termination of Defense Program activities at the NTS would result in unavoidable adverse impacts to the regional socioeconomic conditions including the loss of 4,625 (1,496 direct and 3,129 secondary) jobs in 1996 and 7,981 (2,748 direct and 5,233 secondary) in 2000 and 2005. These adverse effects would be relatively short-term, and economic and natural growth would be expected to compensate for these effects over time.

Because of the presence of landfill wastes, some land uses would continue to be restricted at the radioactive waste management sites and the solid waste landfills.

If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, then these resources may be lost when remediation disturbs the surface. This is an unavoidable impact. Impacts resulting from the illicit collection of artifacts by NTS workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact. Increased numbers of workers and other staff during portions of the period analyzed in this EIS would result in an unavoidable adverse impact on cultural resources. Decommissioning of some contaminated facilities would result in their demolition. If the facility is of historic significance, as many of them are, the loss would be partially mitigated by data gathered in accordance with the documentation requirements of the Historical American Buildings Survey/Historical American Engineering Record system of the National Park Service.

5.5.4.2 Tonopah Test Range. Remediation of the Environmental Restoration Program sites and the Soils Media Corrective Action Unit areas would unavoidably result in removal of the vegetation and surface-soil layers. This would produce PM_{10} in the case of the Environmental Restoration Program sites. Particulates and mobile-source emissions would represent a degradation of the air quality, though minor in this case. Vegetation and some animals would be destroyed, but no population's viability would be threatened. Visual resources would be unavoidably altered. Removal of vegetation and disturbance of soils that differ from the surroundings in color or tone would become evident until recovery had progressed. In some cases, however, vegetation types might be substantially different from that in surrounding areas if rehabilitation with local native species were unsuccessful. The change in species could produce areas that differ in color, tone, and/or texture from the surroundings. Since these areas are not located where they can be observed from public viewpoints and are classified as common scenery, the effects to the visual resource would be minor.

Grading of the surface for restoration of the Soils Media Corrective Action Unit sites would cause some minor alteration of surface-water drainage patterns and some accelerated erosion until stabilization occurred. Minor use of groundwater for dust control and revegetation of the Soils Media Corrective Action Unit sites would be an unavoidable, though minor impact.

Local noise from heavy equipment and drill rigs would be a minor impact.

The necessity of removing cultural resource materials that would otherwise be destroyed by remediation activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. In some cases, contaminated lands might pose an unacceptably high risk to archeological surveyors. Any resources in these areas would be lost to surface disturbance during remediation.

5.5.4.3 Project Shoal and Central Nevada Test Areas. Monitoring, characterization, and any minor remediation would result in very limited surface disturbance. This would result from well drilling, minor excavation, and backfilling of the Project Shoal Area emplacement shaft. Small amounts of PM_{10} and mobile-source emissions would be produced. Heavy equipment and drill rig operations would produce temporary local noise.

Well drilling and characterization activities might require data recovery from some cultural resource sites. Removing cultural resource materials that would otherwise be destroyed by these activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Impacts resulting from the illicit collection of artifacts by workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

Geologic media contaminated by the tests would remain contaminated and would be unavailable for other uses. Groundwater in the vicinity of the shot cavity might be contaminated and, if so, would remain unavailable for any use.

5.5.4.4 Eldorado Valley. Land used for this proposal would be designated for renewable energy development and would be committed to a single use. Depending on where in Eldorado Valley the project is sited, existing land uses would be affected to a greater or lesser degree. Some of the more intensive present uses of the playa are recreational, including land sailing, model aircraft flying, ultralight operations, off-highway vehicle use, and camping. Areas off the playa are used for bird hunting and off-highway vehicle races. All these uses would be incompatible within the area developed for solar generation, and those uses that disturb the surface would probably cause airborne particulates. This would be considered undesirable in the vicinity of solar collectors. The loss of these opportunities would be an unavoidable adverse impact.

Some power and natural gas line construction would be necessary. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and, consequently, would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with the potential to increase tortoise mortality on the highways and roads and on the construction sites themselves. A total of 2,400 acres of habitat could be lost to project construction, and an unknown additional amount would be lost to power and pipe line construction.

The site lies within the Class B airspace (Terminal Control Area) for McCarran International Airport. Glare from the solar collectors could affect aircraft operations. Should this occur, operations at the Solar facility would have to be altered to lessen the effect, which would adversely affect its production, or airport operations would have to be modified to avoid this conflict.

Although the scenery is common to the region, the site is viewed by large numbers of the public traveling Highway 95 and engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Study areas within the site's viewshed. Construction of the solar facilities and associated infrastructure would create considerable change in the visual environment of the valley.

Surface disturbance and construction would result in the production of PM_{10} and mobile-source emissions. Local noise levels would be present during construction.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable impacts such as vandalism and illicit artifact collecting.

5.5.4.5 Dry Lake Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are used for occasional off-highway vehicle races. These races would be incompatible within the area developed for solar generation because the races disturb the surface. The loss of vehicle race opportunities would be an unavoidable adverse impact.

A limited amount of power and natural gas line construction would be necessary. A proposal exists to construct a water line to Coyote Spring Valley to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and, consequently, would affect gene-pool flow in less mobile species like tortoises. The water line has the potential to affect a large area of tortoise habitat in the area to the north along the west side of the Arrow Canyon Range. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites. A total of 2,400 acres of habitat could be lost to project construction; and 560 acres would be lost to power and pipe line construction. Depending upon the quantity of water involved, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace.

The site lies within the Class B airspace (Terminal Control Area) for McCarran International Airport and Nellis Air Force Base. Glare from the collectors could affect aircraft operations. Should this occur, operations at the Solar Enterprise Zone facility would have to be altered to lessen the effect, which would adversely affect its production, or airport operations would have to be modified to avoid this conflict.

The scenery is common to the region, and the site is viewed by the public traveling Highway 93 and Interstate 15 and engaging in recreational pursuits. However, construction of solar facilities and associated infrastructure would have a minor impact on the visual environment because of extensive man-made modifications to the area.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable impacts such as vandalism and illicit artifact collecting.

*5.5.4.6 **Coyote Spring Valley***. Land used for this proposal would be committed to a single use. Some areas of the valley are lightly used for dispersed recreation. This use would be incompatible within the area developed for solar generation. The loss of recreation opportunities would be a minor unavoidable adverse impact.

Substantial power and natural gas line construction would be necessary. A water line would have to be constructed to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and, consequently, would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites themselves. A total of 2,400 acres of habitat could be lost to project construction, and 960 acres would be lost to power and pipe line construction. This habitat in Coyote Spring Valley has been designated by the U.S. Bureau of Land Management as critical habitat for the threatened desert tortoise. Specific project locations are necessary before a determination can be made regarding the potential to adversely affect any sensitive species present in the valley. Depending on the quantity of water involved, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace. The use of groundwater might also have the potential to affect local springs in the valley.

Scenic quality of the site has been designated Class B and the site is viewed by the public traveling Highway 93 or engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Areas within the site's viewshed. Construction activities, and the solar activities and associated infrastructure would greatly change the landscape character of Coyote Spring Valley and have an adverse impact on the visual environment.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.6 Relationship of Short-Term Uses and Long-Term Productivity

Short-term uses are defined as those that take place during the 10-year timeframe covered in this EIS analysis. Long-term is defined as the time period beyond the 10-year timeframe of the NTS EIS analysis. If the resource cannot be rehabilitated to its most productive long-term use within a 10-year timeframe, then it is considered in this analysis to be impaired for the long term.

5.6.1 Alternative 1

The relationship of short-term use and long-term productivity under Alternative 1 is discussed in the following sections.

5.6.1.1 Nevada Test Site. The majority of effects on long-term productivity would result from the continuation of present land use and from future land use associated with Alternative 1. Developed areas like Mercury, forward area camps, drill yards, roads, power lines, and waste disposal sites would continue to be largely unproductive ecologically, but would continue long-term contributions through their support of research and development and training. Operating waste disposal sites would contribute to long-term productivity through the remediation of other areas and their return to productive uses. The Big Explosives Experimental Facility would result in surface clearing on 30 acres, which could be remediated and made available for most uses upon cessation of operations. The Big Explosives Experimental Facility's 7,080-acre buffer area would be unavailable for human use, but the ecological productivity should remain largely intact.

An underground nuclear test would result in the subsurface being unavailable for the long term. Following an underground nuclear test, the surface 40 acres could be available for limited uses unless cavity collapse has not occurred. Underground subcritical experiments would result in the mined cavity being unavailable for the long term. Following subcritical experiments, the land surface would be unaffected and unrestricted. Similarly, the Area 3 and Area 5 Waste Management Program sites would have an area of 34 acres of disturbed surface and an area of 821 acres of buffer zones. The disturbed areas would be restricted from subsurface access for the long term, and the surface would be restricted from most uses. Rehabilitation of the surface following closure would restore ecological productivity unless rock armor is used in closure. Rock armor would result in a sterile surface for the long term. The area in the buffer zones would have some restrictions on surface uses designed to prevent intrusion into the buried waste. Because it would likely remain undisturbed, its ecological productivity would remain unimpaired for the long term. Eighty acres would be disturbed for the long term in conjunction with weapons assembly/disassembly/interior storage.

Geologic resources and groundwater in the vicinity of the underground nuclear test would have long-term impairment of productivity. Disruption and contamination would mean the unavailability of the geologic resources in the vicinity of the shot cavity for the long term. While the effect on groundwater of underground tests detonated in or near the water table remains to be determined, any contamination in excess of regulatory levels would mean the long-term unavailability of the affected water. There also exists the possibility that collapse craters and their rubble chimney would provide preferential pathways from the surface to the vicinity of shot cavities, which could result in groundwater contamination.

Previous groundwater use in Yucca Flat has exceeded the perennial yield. However, during 1984 to 1994, water levels rose 26 m (85 ft), suggesting that reductions in the water table might not be long term. Activities within this alternative would disturb nearly 9,900 acres, most of which has been previously disturbed.

Depending on cleanup levels, the Environmental Restoration Program would result in the disturbance of up to 9,800 acres through soil removal to remediate contaminated areas. Where removed soil would be disposed of, its productivity would be lost for the long term. Revegetation would be implemented where environmental conditions favor success, which would enhance long-term productivity. Where site conditions are unfavorable, slow natural rehabilitation would impair long-term ecological productivity. Site remediation would make these areas available for other uses, thus the short-term effects of site remediation would ultimately result in enhanced long-term productivity.

Operations of the Liquid Waste Treatment System and the Spill Test Facilities might produce some limited short-term wildlife mortality. Long-term productivity would be enhanced by the remediation at the Liquid Waste Treatment System. It would contribute to understanding the effects of underground testing on the groundwater. Similarly, what is learned through use of the Spill Test Facility would assist in mitigating the environmental effects of accidental hazardous substance releases.

Visual resources would be altered by the surface manifestations of underground tests. Some Environmental Restoration Program activities and waste management sites could result in surface disturbance. Surface cratering and the slow recovery of vegetation in arid environments would cause a long-term visual resource effect. Most of the NTS is comprised of common scenery and is not visible from public viewpoints. This reduces the impact of the long-term effects.

Cultural resources that cannot be avoided by a project would be subjected to data recovery in order to mitigate the impact of the activity on their values. While this enhances the short-term knowledge base, it also removes some of the potential for an even greater recovery of information to be gained through future studies using improved technology. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.1.2 Tonopah Test Range. Surface disturbance for both the Soils Media Corrective Action Unit and the Environmental Restoration Program industrial site remediation would produce short-term disruption of the ecosystem and soils. Ecological productivity would be reduced for the short term, but would probably be enhanced over the long term because of the removal of contamination. Variables would be the amount of soil removed and the ultimate success in reestablishing native vegetation species. There would be some short-term alteration of surface-water drainage patterns. Some PM_{10} would be produced in the short term from the Environmental Restoration Program sites. Temporary mobile-source emissions would be produced, but there would be no long-term effects.

Visual resources would be affected. The slow natural recovery of vegetation in arid environments would cause a long-term visual effect.

Noise associated with remediation heavy equipment and drill rigs would cause local short-term noise and no long-term effects.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.1.3 Project Shoal and Central Nevada Test Areas. Short-term effects would be noise, minor local air-quality effects, and a very minor localized decline in ecological productivity at the sites of surface disturbance. Restoration of the drilling mud pits at the Central Nevada Test Area and other areas of contamination would increase the long-term ecological productivity. The long-term effect would be to open the area to a greater variety of land use since monitoring and surface remediation would assure that no accessible contamination is present.

5.6.2 Alternative 2

The relationship of short-term uses and long-term productivity under Alternative 2 are discussed in the following sections.

5.6.2.1 Nevada Test Site. Short-term use would consist primarily of shutdown activities, which would be similar to the levels of Waste Management and Environmental Restoration Program activities proposed in Alternative 1. However, Alternative 2 shutdown activities would be more limited in scope and duration. Consequently, they pose less potential to impact the site's resources than Alternative 1.

Short-term "nonuse" of the site would mean that developed areas would remain standing and undergo slow decay. Decay of some historic structures could result in the loss of data relating to the theme of nuclear development over the long term. Only those limited facilities needed to support security and long-term environmental monitoring would be maintained. The remaining industrial areas, e.g., Mercury and the forward area camps, would slowly regain their ecological productivity as they physically decline. Compared to Alternative 1, some recovery of ecological productivity would occur. However, the lack of maintenance would result in either extensive repairs

or demolition and reconstruction should the site be reactivated.

Waste disposal would result in some minor amount of land being committed to long-term use as a disposal site. Alternative uses would be very limited because of the need to protect the subsurface from intrusion.

Environmental Restoration Program activities would cease except for those sites that are immediately hazardous. This would mean that over the long term, contaminants could slowly spread in soils, geologic media, and groundwater, thus affecting much larger areas.

Migration of uncontained contaminants over the long term could cause restrictions on land and groundwater use in surrounding lands, primarily the NAFR Complex. Some presently contaminated areas would remain contaminated and would be of restricted use for the long term. Lined drilling sumps that partially fill with precipitation would continue to cause some drowning of animals and birds.

Clark County unemployment would rise an additional 3.2 percent under Alternative 2, while Nye County rates would rise an additional 6.1 percent in 1997 when compared to Alternative 1. Similarly, housing vacancy rates for Clark County would rise from 7.9 percent with Alternative 1 to 8.5 percent with Alternative 2 in 1998. Nye County vacancy rates would rise from 16.2 percent to 17.8 percent in 1998. Over the long term, growth in these areas would compensate for these losses. The lasting effect would be the out-migration of technical and engineering personnel and the loss of significant employment opportunities for graduates of Nevada's universities.

Vastly reduced groundwater pumping would result in aquifer recovery and enhanced storage. Long-term effects on springs in regional discharge areas might include maintenance of current flows or enhanced flows.

Some continuing effects on biological resources would exist because of shutoff of water sources that support populations of birds and animals. Tortoise mortality would decline because of limited traffic on roads. Potential public health risk from tritium in the groundwater would remain the same as under Alternative 1.

5.6.2.2 Tonopah Test Range. No short-term effects would accumulate under Alternative 2. The chief potential long-term effects would depend on the amount of migration or spreading that would occur from those sites that are presently contaminated. Migration could affect potential future land-use options and soil productivity. Remediation would be economically unfeasible if contaminants migrate.

5.6.2.3 Project Shoal and Central Nevada Test Areas. There would be no short-term effects. Some limited use of the land could be viable for the long term; access to the subsurface would remain restricted.

There would be no short-term need to conduct data recovery at cultural resource sites; therefore, the resource sites would remain available to future researchers. They might be able to obtain greater data recovery because of enhanced future technology. These resource sites would, however, remain vulnerable to vandalism and the consequent loss of all data.

5.6.3 Alternative 3

The relationship of short-term uses and long-term productivity under Alternative 3 are discussed in the following sections.

5.6.3.1 Nevada Test Site. The majority of effects on long-term productivity would result from the continuation of present land uses and from future land uses associated with this alternative. Developed areas (e.g., Mercury, forward area camps, drill yards, roads, power lines, and waste disposal sites) would continue to be largely unproductive ecologically, but would continue long-term contributions through their support of research and development, and training. A large area would be unproductive ecologically within the alternative energy sites. However, the energy produced would be clean and would prevent the occurrence elsewhere of the more significant impacts associated

with other forms of energy production, such as fossil, fuels, hydropower, and nuclear. Thus, alternative energy production would create a substantial long-term benefit. Operation of waste disposal sites would contribute to long-term productivity through the remediation of other areas and their return to productive uses. The Big Explosives Experiment Facility would result in surface clearing on 30 acres, which could be remediated and made available for most uses upon cessation of operations. Its 7,000-acre buffer area would be unavailable for human use, but the ecological productivity should remain largely intact. Underground nuclear tests would result in the subsurface being unavailable for the long term. The surface above an underground test could be available for limited use unless cavity collapse has occurred at the underground test. Underground subcritical experiments would result in the mined cavity being unavailable for the long term. Following subcritical experiments, the land surface would be unaffected and unrestricted. The Waste Management Program sites would be restricted from subsurface access for the long term. Rehabilitation of the surface upon closure would result in restored ecological productivity unless rock armor is used in closure. Construction of a large, heavy-industrial facility, expansion of the Device Assembly Facility, facilities for the handling and storage of weapons-usable fissile materials, and advanced hydrodynamic testing would take land and habitat out of production for the long term. The area involved would be very small compared to the size of the NTS and would have limited effect.

Geologic resources and groundwater would have long-term impairment on productivity with an underground nuclear test. Disruption and contamination would cause the unavailability of geologic resources in the vicinity of the shot cavity for the long term. While the effect on groundwater of underground tests detonated in or near the water table remains to be determined, any contamination in excess of regulatory levels would mean the long-term unavailability of the affected water. There also exists the possibility that collapsed craters would provide preferential pathways down rubble chimneys from the surface to the vicinity of shot cavities. This could result in groundwater contamination.

Previous groundwater use in Yucca Flat has exceeded the perennial yield. However, during 1984 to 1994, water levels rose 26 m (85 ft), suggesting that reductions in the water table might not be long term. This alternative would result in substantially greater groundwater use, which might result in long-term effects on the aquifer.

Depending on cleanup levels, Environmental Restoration Program activities would result in the disturbance of up to 9,800 acres through soil removal to remediate contaminated areas. The productivity of removed soil would be lost for the long term. Revegetation would be implemented where environmental conditions favor success. Success would enhance long-term productivity. Where site conditions are unfavorable, slow natural rehabilitation would impair long-term ecological productivity. Site remediation would make these areas available for other uses. The short-term effects of remediation would ultimately result in enhanced long-term productivity.

Operations of the Liquid Waste Treatment Facility and the Spill Test Facility might produce some limited short-term wildlife mortality; long-term productivity would be enhanced by the remediation that the Liquid Waste Treatment System would support. Operations would contribute to understanding the effects of underground testing on the groundwater. Similarly, what is learned through use of the Spill Test Facility would assist in mitigating the environmental effects of accidental hazardous substance releases.

Visual resources would be affected by underground tests. Some Environmental Restoration Program activities and waste management sites could result in surface disturbance. Surface cratering and the slow recovery of vegetation in arid environments would cause a long-term visual resource effect. Most of the NTS is comprised of common scenery and is not visible from public viewpoints. This would reduce the impact of the long-term effects.

Cultural resources that cannot be avoided by a project are subjected to data recovery. While this enhances the short-term knowledge base, it also removes some of the potential for an even greater recovery of information to be gained through future

studies using improved technology. Implementation of the new projects proposed in Alternative 3 would result in the need to conduct surveys over large areas and to recover the data from these sites. This would represent an increase in the impact of Alternative 3 on cultural resources as compared to Alternative 1. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to increase as compared to Alternatives 1 and 2. This could result in a cumulative negative impact to cultural resources over the long term.

5.6.3.2 Tonopah Test Range. Surface disturbance for both Soils Media Corrective Action Unit and the Environmental Restoration Program industrial site remediation would produce short-term disruption of the ecosystem and soils. Ecological productivity would be reduced for the short term, but would probably be enhanced over the long term because of the removal of contamination. Variables would be the amount of soil removed and the ultimate success in reestablishing native vegetation species. See Section 4.1.6, Biological Resources (FLORA), for a description of variables that influence natural plant succession rates, revegetation techniques, and revegetation success. There would be some short-term alteration of surface-water drainage patterns. Some PM_{10} would be produced in the short term from the Environmental Restoration Program sites. Temporary mobile-source emissions would be produced. There would be no long-term effects.

Visual resource would be affected. The slow natural recovery of vegetation in arid environments would cause a long-term visual effect.

Noise associated with remediation heavy equipment and drill rigs would cause local short-term noise and no long-term effects.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.3.3 Project Shoal and Central Nevada Test Areas. Short-term effects would be noise, minor local air-quality effects, and a very minor localized decline in ecological productivity at the sites of surface disturbance. Restoration of the drilling mud pits at the Central Nevada Test Area and other areas of contamination would increase the long-term ecological productivity. The long-term effect would be to open the area to a greater variety of land use. Monitoring and surface remediation would ensure that no accessible contamination would be present.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

Contaminated geologic media and groundwater would remain unavailable for the long term.

5.6.3.4 Eldorado Valley. Land use would be committed to a single use for the long term. Other primarily recreational uses would be precluded or substantially reduced. The installation or upgrading of infrastructure would facilitate future development in the valley. The long-term effect on the area's low-density tortoise population would be negative. Since it is difficult to restore pristine conditions in arid environments, it would be likely that even upon removal of a solar project, habitat would not reach its former condition over the long term.

The use of aggregate and fill materials for construction would be a long-term commitment of these resources, which are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent an impact. Data recovered represents a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically

sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

*5.6.3.5 **Dry Lake Valley**.* Land use would be committed to a single use for the long term. Other primarily recreational uses would be precluded or substantially reduced. The installation or upgrading of infrastructure would facilitate future development in the valley. The long-term effect on the area's low- density tortoise population would be negative. Construction of a water line to Dry Lake Valley has the potential to substantially impact tortoise habitat. This would have a substantial long-term impact on tortoise populations to the north, particularly if existing power line rights-of-way were not used. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. Since it is difficult to restore pristine conditions in arid environments, it is likely that even upon removal of a solar project, the habitat would not reach its former condition over the long term.

The use for construction of aggregate and fill materials, which are common in the region, would be a long-term commitment of these resources.

Removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies.

*5.6.3.6 **Coyote Spring Valley**.* Land use would be committed to a single use for the long term. Other primarily dispersed light recreational uses would be precluded or substantially reduced. Depending on the location within the valley, the long-term effect on the area's tortoise population and critical habitat for this species would be negative. Construction of a water line in Coyote Spring Valley has the potential to substantially impact tortoise habitat. This could have a substantial long-term impact on tortoise populations particularly if existing power line rights-of-way were not used. The installation or upgrading of infrastructure would facilitate future development in the valley. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. If local spring discharges were reduced or stopped, species dependent on them could be lost for the long term. Because it is difficult to restore pristine conditions in arid environments, it would be likely that even upon removal of a solar project, the habitat would not reach its former condition over the long term.

The use for construction of aggregate and fill materials, which are common in the region, would be a long-term commitment of these resources.

Removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, removed from their context these materials would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar-generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.4 Alternative 4

The relationship of short-term use and long-term productivity under Alternative 4 is discussed in the following sections.

*5.6.4.1 **Nevada Test Site**.* The majority of effects on long-term productivity would result from the continuation of present land use and from future land use associated with Alternative 4. Developed areas like Mercury, e.g., forward area camps, drill yards, roads, power lines, and waste disposal sites, would continue to be largely unproductive ecologically, but would continue long-term contributions through their support of research and development and training. Operating waste disposal sites would contribute to long-term productivity through the remediation of other areas and their return to productive uses. Similarly, the waste management sites would be restricted from subsurface access for the long term. Rehabilitation

of the surface upon closure would result in restored ecological productivity.

Previous underground testing has resulted in long-term impairment of geologic resources and groundwater productivity, but Alternative 4, unlike Alternative 1 would not include the impacts of additional underground nuclear tests. Disruption and contamination would mean the unavailability of the geologic resources in the vicinity of the shot cavity for the long term. The effect on groundwater of underground tests detonated in or near the water table remains to be determined. Any contamination in excess of regulatory levels would mean the long-term unavailability of the affected water. There also exists the possibility that collapsed craters would provide preferential pathways from the surface down rubble chimneys to the vicinity of shot cavities, which could result in groundwater contamination.

There are two candidate sites at the NTS for the Solar Enterprise Zone facility, Fortymile Canyon in Area 25 and Mercury Valley in Area 22. Peak historic demand has not exceeded perennial yield at either location. However, a Solar Enterprise Zone facility would require a substantial increase in groundwater use. Total groundwater withdrawal would increase above the natural recharge of the affected aquifer. This would require the use of some underflow and could result in long-term effects on groundwater resources.

Depending on cleanup levels, Environmental Restoration Program activities would result in the disturbance of up to 9,800 acres, through soil removal to remediate contaminated areas. Removed soil productivity would be lost for the long term. See Section 4.1.6, Biological Resources (FLORA), for a description of natural plant succession rates, revegetation techniques, and revegetation success. Revegetation would be implemented where environmental conditions favor success. Success would enhance long-term productivity. Where site conditions are unfavorable, slow natural rehabilitation would impair long-term ecological productivity. Site remediation would make these areas available for other uses. The short-term effects of remediation would ultimately result in enhanced long-term productivity.

Operations of the Liquid Waste Treatment System and the Spill Test Facility might produce some limited short-term wildlife mortality; long-term productivity would be enhanced by the remediation that the Liquid Waste Treatment System would support and by its contribution to understanding the effects of underground testing on the groundwater. Similarly, what is learned through use of the Spill Test Facility would assist in mitigating the environmental effects of accidental hazardous substance releases.

Visual resources would be affected by some Environmental Restoration Program activities that result in surface disturbance, and waste management sites. The slow recovery of vegetation in arid environments would cause a long-term visual resource effect. Much of the NTS is comprised of common scenery, but would become more visible to the public with its opening to other public uses. This would increase the impact of the long-term effects.

Cultural resources that cannot be avoided by a project are subjected to data recovery to mitigate the impact of the activity on their values. While this enhances the short-term knowledge base, it also removes some of the potential for an even greater recovery of information to be gained through future studies using improved technology.

5.6.4.2 Tonopah Test Range. Surface disturbance for both the Soils Media Corrective Action Unit and the Environmental Restoration Program site remediation would produce short-term disruption of the ecosystem and soils. Ecological productivity would be reduced for the short term, but would probably be enhanced over the long term because of the removal of contamination. Variables would be the amount of soil removed and the ultimate success in reestablishing native vegetation species. There would be some short-term alteration of surface-water drainage patterns. Some PM_{10} would be produced in the short term from the Environmental Restoration Program sites. Temporary mobile-source emissions would be produced. There would be no long-term effects.

Visual resources would be affected. The slow natural recovery of vegetation in arid environments would cause a long-term visual effect.

Noise associated with remediation heavy equipment and drill rigs would cause local short-term noise and no long-term effects.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.4.3 Project Shoal and Central Nevada Test Areas. Short-term effects would be noise, minor local air-quality effects, and a very minor localized decline in ecological productivity at the sites of surface disturbance. Restoration of the drilling mud pits at the Central Nevada Test Area and other areas of contamination would increase long-term ecological productivity. The long-term effect would be to open the area to a greater variety of land uses since monitoring and surface remediation would ensure that no accessible contamination would be present.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

Contaminated geologic media and groundwater would remain unavailable for the long term.

5.6.4.4 Eldorado Valley. Land use would be committed to a single use for the long term. Other primarily recreational use would be precluded or substantially reduced. The installation or upgrading of infrastructure would facilitate future development in the valley. The long-term effect on the area's low- density tortoise population would be negative. Since it is difficult to restore pristine conditions in arid environments, it would be likely that, even upon removal of a solar project, the habitat would not reach its former condition over the long term.

The use of aggregate and fill materials for construction would be a long-term commitment of these resources, which are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar-generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.4.5 Dry Lake Valley. Land use would be committed to a single use for the long term. Other primarily recreational use would be precluded or substantially reduced. The long-term effect on the area's low-density tortoise population would be negative. Construction of a water line to Dry Lake Valley has the potential to substantially impact tortoise habitat. This would have a substantial long-term impact on tortoise populations to the north, particularly if existing power line rights-of-way were not used. The installation or upgrading of infrastructure would facilitate future development in the valley. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. Since it is difficult to restore pristine conditions in arid environments, it would be likely that, even upon removal of a solar project, habitat would not reach its former condition over the long term.

The use of aggregate and fill materials for construction would be a long-term commitment of these resources, which are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology

would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar-generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.4.6 Coyote Spring Valley. Land use would be committed to a single use for the long term. Other primarily dispersed light recreational uses would be precluded or substantially reduced. Depending on the location within the valley, the long-term effect on the area's tortoise population and critical habitat for this species would be negative. Construction of a water line in Coyote Spring Valley has the potential to substantially impact tortoise habitat. This could have a substantial long-term impact on tortoise populations, particularly if existing power line rights-of-way were not used. The installation or upgrading of infrastructure would facilitate future development in the valley. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. If local spring discharges were reduced or stopped, species dependent on them could be lost for the long term. Since it is difficult to restore pristine conditions in arid environments, it would be likely that, even upon removal of a solar project, habitat would not reach its former condition over the long term.

The use for construction of aggregate and fill materials would be a long-term commitment of the resources that are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.7 Irreversible and Irretrievable Commitment of Resources

This section identifies the major irreversible and irretrievable commitments of resources that are identifiable at the sitewide level of analysis. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of resources neither renewable nor recoverable for later use by future generations. The major irreversible and irretrievable commitment is land use, with lesser commitments of harvestable products, materials, groundwater, and energy.

Implementation of any of the alternatives would result in a permanent commitment of certain air, groundwater, soil, biota, mineral, surface, and subsurface resources. There would be an irreversible and irretrievable commitment of the associated natural resource services. In addition to the National Environmental Policy Act requirement to identify the irreversible and irretrievable commitments of resources, it is also the intent of the DOE to identify these resources within the meaning of the Comprehensive Environmental Response, Compensation, and Liability Act, Section 107(f)(1). Section 107(f)(1) which addresses natural resource damage liability and states that the liability is obviated if:

> ". . . the damages to natural commitments of resources complained of were specifically identified as irreversible and irretrievable commitments of resources in an environmental impact statement, or other comparable environmental analysis, and the decision to grant a permit or license authorizes such commitment of natural resources, and the facility or project was otherwise operating within the terms of its permit or license, so long as, in the case of damages to an Indian tribe occurring pursuant to a Federal permit or license, the issuance of that permit or license was not inconsistent with the fiduciary duty of the United States with respect to such Indian tribe."

5.7.1 Alternative 1

The irreversible and irretrievable commitments of resources that would result under Alternative 1 are presented for the NTS, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area.

5.7.1.1 Nevada Test Site. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, Control Point 1, and so on would remain in an urban or industrial configuration. Thus, a long-term land-use commitment exists that would preclude alternative, nonurban use. Natural habitat productivity at these locations would be reduced. Even with removal of the structures and infrastructure, completely natural conditions would be unlikely to be achieved.

Although technically reversible through excavation and clean closure, use of the radioactive waste management facilities for waste disposal would result in an irreversible and irretrievable commitment of the sites and surrounding buffer areas. Land uses would be severely restricted, as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would likely be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface uses.

Underground nuclear tests would represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent use. The surface above an underground nuclear test would be restricted from all access if cratering has not occurred. Where cratering has occurred, some limited surface use would be permissible. Underground subcritical experiments would result in an irreversible and irretrievable commitment of the mined cavity for subsequent use. Following subcritical experiments, the land surface would be unaffected and unrestricted.

Decontamination and decommissioning activities would produce mixed results depending on the remedy selected. Entombment would result in an irretrievable and irreversible commitment of the surface or associated subsurface for most land use. Most decontamination and decommissioning activities would result in either decontamination and consequent availability of the facility for other use or demolition of the facility and disposal. Reuse would entail the facility remaining in an industrial mode, which would represent a long-term commitment to that type of land use. Demolition of the facility would result in the land's availability for other development or for site rehabilitation and use as natural habitat.

Although technically reversible through excavation and clean closure, closure in place would result in an irreversible and irretrievable commitment for those Resource Conservation and Recovery Act industrial sites that are so treated. Land use on these sites and in a surrounding buffer zone would be severely constrained. Rehabilitation by revegetation would permit their functioning as natural habitat, but closure would likely be designed using rock armor to inhibit vegetation or burrowing by animals.

Continued airspace restriction would represent an irreversible and irretrievable commitment because access would be limited to government use only, to the detriment of general aviation and commercial users.

Energy and materials utilized in the construction, operation, maintenance, decontamination, demolition, and closure of the facilities would be irreversibly and irretrievably committed. Detonation of high or nuclear explosives would be an irreversible and irretrievable commitment of energy resources.

Industrial accidents resulting in injuries or deaths and latent cancer fatalities caused by worker exposure to radiation at the NTS would represent an irreversible and irretrievable commitment of human resources.

Continued restriction of harvest of products like game, pine nuts, or grass, and maintenance of areas in development that precludes their natural productivity, would represent an irretrievable commitment of resources. However, the area of the

NTS that would be developed or committed to such use as radioactive waste disposal is a small fraction of the total area.

Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled and any associated natural resource services that they provide would be lost as well. Environmental restoration would involve up to about 9,800 acres, most of which have been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels.

The conduct of one or more underground nuclear tests would result in an undetermined impact on groundwater quality if it occurred in or near the water table. Any groundwater contamination in excess of EPA drinking water standards would constitute an irreversible and irretrievable commitment of a presently unquantifiable amount of water. Similarly, any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at existing and future potential underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services.

A total of 2.1×10^6 m^3 per year (5.5×10^8 gal/yr) of water would be used to support all NTS programs under Alternative 1. This water would represent an irreversible and irretrievable commitment of this resource.

Electric usage would total 6.9×10^6 kW hrs/month, while fuel usage would total 708 m^3 per month (187,000 gal/month), which would represent an irreversible and irretrievable commitment of the energy resources.

A total of about 59,000 acres has been disturbed to date, and an additional 9,900 acres would be disturbed over the next 10 years. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present uses. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

5.7.1.2 Tonopah Test Range. Much of the activity at the Tonopah Test Range takes place on the playas, hence surface disturbance would produce no effects on most other resources. No new surface disturbance would occur under Alternative 1. Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled and any associated natural resource services that they provide would be lost as well. Environmental restoration activities could involve several hundred acres, most of which have been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present uses. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

5.7.1.3 Project Shoal and Central Nevada Test Areas. About 10 acres at the Project Shoal Area and 40 acres at the Central Nevada Test Area would be disturbed through environmental remediation. Most of these areas were previously disturbed, so this would represent a setback in the ecological succession that has occurred. In addition, the subsurface areas at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Other irreversible and irretrievable losses may be incurred as a result of vandalism and illicit artifact collecting.

5.7.2 Alternative 2

The irreversible and irretrievable commitment of resources that would result under Alternative 2 are presented for the NTS, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area.

5.7.2.1 Nevada Test Site. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, and Control Point 1 would remain in an urban or industrial configuration. Thus, a long-term land-use commitment exists that would preclude alternative, nonurban uses. Natural habitat productivity at these locations would be reduced.

Although less use of the radioactive waste management facilities for waste disposal would occur with this alternative than with Alternative 1, there would still be an irreversible and irretrievable commitment of the sites and surrounding buffer areas. Land use would be severely restricted as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface uses.

The effects of this alternative would be similar to those of Alternative 1. An insignificant lower increment of effect would exist since there would be no Defense Program activities. The existing underground nuclear test areas represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent uses. The surface would continue to be restricted from all access if cratering has not occurred.

Continued airspace restriction would represent an irreversible and irretrievable commitment of that access to government uses only, to the detriment of general aviation and commercial users.

Continued restriction of harvest of annually perishable products like game, pine nuts, or grass and maintenance of areas in development that precludes their natural productivity represent an irretrievable commitment of resources. However, the area of the NTS that is developed or committed to such uses as radioactive waste disposal is a small fraction of the total area.

Any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services. Contaminated soils that are not remediated would be irretrievably lost as a soil resource.

Water used to support the environmental monitoring and security functions remaining at the NTS under Alternative 2 would represent an irreversible and irretrievable commitment of the resource.

Electric usage would total 89,744 kW hrs/month, while fuel usage would total 11 m^3 per month (2,778 gal/month), which would represent an irreversible and irretrievable commitment of the energy resources.

A total of about 59,000 acres has been disturbed to date, and no additional acres would be disturbed over the next 10 years. These acres would be irreversibly and irretrievably committed to their present use. This would result in a minimal to total reduction of their associated natural resource services.

5.7.2.2 ***Tonopah Test Range.*** The only irreversible and irretrievable commitment that would occur is if contaminant migration was such that future remediation were rendered to be uneconomic.

5.7.2.3 ***Project Shoal and Central Nevada Test Areas.*** Contaminated mud pits at the Project Shoal and Central Nevada Test Areas would remain irreversible and irretrievable commitments to a restricted land use in their vicinity. In addition, the subsurface area at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

5.7.3 Alternative 3

The irreversible and irretrievable commitment of resources that would result under Alternative 3 is presented for the NTS, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

5.7.3.1 ***Nevada Test Site.*** Developed areas like Mercury, Area 12 Camp, Area 25 Complex, Control Point 1, and so on are likely to remain in an urban or industrial configuration. Thus, a long-term commitment exists that would preclude alternative, nonurban use. Natural habitat productivity at these locations would be reduced. Even with removal of the structures and infrastructure, completely natural conditions would be unlikely to be achieved.

Although technically reversible through excavation and clean closure, use of the radioactive waste management facilities for waste disposal would result in an irreversible and irretrievable land use commitment of the sites and surrounding buffer areas. Land use would be severely restricted as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface uses. Rehabilitation of the surface upon closure would make the sites available as natural habitat.

Underground nuclear tests would represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent use. The surface above an underground nuclear test would be restricted from all access if cratering has not occurred. Where cratering has occurred, some limited surface use would be permissible. Underground subcritical experiments would result in an irreversible and irretrievable commitment of the mined cavity for any subsequent use. Following subcritical experiments, the land surface would be unaffected and unrestricted.

Decontamination and decommissioning activities would produce mixed results depending on the remedy selected. Entombment would result in an irretrievable and irreversible commitment of the surface or associated subsurface for most land use. Most decontamination and decommissioning

activities would result in either decontamination and consequent availability of the facility for other use or demolition of the facility and disposal. Reuse would entail the facility remaining in an industrial mode, which represents a long-term commitment to that type of land use. Demolition of the facility would result the land's availability for other development or for site rehabilitation and use as natural habitat.

Although technically reversible through excavation and clean closure, closure in place would result in an irreversible and irretrievable commitment for those Resource Conservation and Recovery Act industrial sites that are so treated. Land use above these sites and in a surrounding buffer zone would be severely constrained. Rehabilitation by revegetation would permit their functioning as natural habitat, but closures would likely be designed using rock armor to inhibit vegetation or burrowing by animals.

Continued airspace restriction would represent an irreversible and irretrievable commitment of that access to government use only.

Energy and materials utilized in the construction, operation, maintenance, decontamination, demolition, and closure of the facilities would be irreversibly and irretrievably committed. Detonation of high or nuclear explosives would be an irreversible and irretrievable commitment of energy resources. Additional projects, including the alternative energy developments, would constitute a greater commitment of resources than would Alternative 1.

Industrial accidents resulting in injuries or deaths and latent cancer fatalities caused by worker exposure to radiation at the NTS would represent an irreversible and irretrievable commitment of human resources.

Continued restriction of harvest of products like game, pine nuts, or grass and maintenance of areas in development that precludes their natural productivity would represent an irretrievable commitment of resources. However, the area of the NTS that is developed or committed to such use as radioactive waste disposal is a small fraction of the total area.

Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. See Section 4.1.6, Biological Resources (FLORA), for a description of variables that influence natural plant succession rates, revegetation techniques, and revegetation success. Where suitable subsoils occur with acceptable parameters (e.g., low soluble salts, appropriate texture, and adequate quantities to ensure plant establishment and rooting), they could be used directly for revegetation. Subsoils could be amended, if necessary, to provide a suitable substrate for plant establishment and growth. Amendments would be based on a site evaluation of what soil resources are available and prevailing site conditions (e.g., climatic conditions). See Section 5.1.1.4 for a discussion of reclamation options. Environmental restoration would involve up to about 9,800 acres, most of which have been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels.

The conduct of one or more underground nuclear tests would result in an undetermined impact on ground water quality if it occurred in or near the water table. Any groundwater contamination in excess of EPA drinking water standards would constitute an irreversible and irretrievable commitment of a presently unquantifiable amount of water. Similarly, any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at the existing and potential future underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services.

A total of 1.1 x 10^5 m^3 per year (2.9 x 10^7 gal/yr) of water would be used to support all NTS programs under Alternative 3. This water would represent an irreversible and irretrievable commitment of this resource.

Electric usage would total 1.4 x 10^6 kW hrs/month, while fuel usage would total 1,427 m^3 per month (376,987 gal/month).

A total of about 59,000 acres has been disturbed to date, and approximately 15,600 more acres would be disturbed over the next 10 years. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present and proposed use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

5.7.3.2 Tonopah Test Range. Much of the activity at the Tonopah Test Range takes place on the playas, hence surface disturbance would produce no effects on most other resources. No new surface disturbance would occur under Alternative 3. Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. Environmental restoration activities could involve several hundred acres, most of which has been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.3.3 Project Shoal and Central Nevada Test Areas. About 10 acres at the Project Shoal Area and 40 acres at the Central Nevada Test Area would be disturbed through environmental remediation. Most of these areas were previously disturbed, so this would represent a setback in the ecological succession that has occurred. In addition, the subsurface area at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.3.4 Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. The irreversible and irretrievable commitment of resources resulting from the construction and operation of a Solar Enterprise Zone facility in Eldorado, Dry Lake, or Coyote Spring Valleys would be the same and are presented in the following section. Ecological

productivity would be greatly reduced or completely stopped during the period of time in which the Solar Enterprise Zone facility would be operating. The ecosystem's contribution would be irretrievably lost for that period of time and would likely never return to its present status.

The use of materials for construction would be an irreversible and irretrievable long-term commitment of the resources.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the future recovery of some data would be precluded due to the limited capability of present technology to recover certain information.

Construction of roads in areas proposed for solar generating facilities is likely to result in a greater incidence of vandalism and illicit artifact collecting within archaeologically sensitive areas. This could result in an irreversible and irretrievable loss of their information value.

5.7.4 Alternative 4

The irreversible and irretrievable commitment of resources that would result under Alternative 4 is presented for the NTS, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

5.7.4.1 Nevada Test Site. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, and Control Point 1 are likely to remain in an urban or industrial land use. Thus, a long-term land-use commitment exists that would preclude alternative, nonurban use. Natural habitat productivity at these locations would be reduced. Even with removal of the structures and infrastructure, completely natural conditions would be unlikely to be achieved.

Although technically reversible through excavation and clean closure, use of the radioactive waste management facilities for waste disposal would result in an irreversible and irretrievable commitment of the sites and surrounding buffer areas. Land use would be severely restricted as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface use.

Past underground nuclear tests would represent, in large part, a continuing irreversible and irretrievable commitment of the subsurface for any subsequent use. The surface above an underground test would be restricted from all access if cratering has not occurred. Where cratering has occurred, some limited surface use would be permissible.

Decontamination and decommissioning activities would produce mixed results depending on the remedy selected. Entombment would result in an irretrievable and irreversible commitment of the surface or associated subsurface for most land use. Most decontamination and decommissioning activities would result in either decontamination and consequent availability of the facility for other use or demolition of the facility and disposal. Reuse would entail the facility remaining in an industrial mode that represents a long-term commitment to that type of land use. Demolition of the facility would result in the land's availability for other development or for site rehabilitation and use as a natural habitat.

Although technically reversible through excavation and clean closure, closure in place would result in an irreversible and irretrievable commitment for those Resource Conservation and Recovery Act industrial sites that are so treated. Land use at these sites and in a surrounding buffer zone would be severely constrained. Rehabilitation by revegetation would permit their functioning as natural habitat, but closures would likely be designed using rock armor to inhibit vegetation or burrowing by animals.

Energy and materials utilized in the construction, operation, maintenance, decontamination, demolition, and closure of facilities would be irreversibly and irretrievably committed.

Industrial accidents resulting in injuries at the NTS could, depending on the type of injury, represent an irreversible and irretrievable commitment of human resources.

Continued restriction of harvest of annually perishable products like some game, pine nuts, or grass and maintenance of areas in development that precludes their natural productivity, represents an irretrievable commitment of resources. However, the area of the NTS that is developed or committed to such use as radioactive waste disposal is a small fraction of the total area.

Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. Environmental restoration activities would involve up to about 9,800 acres, most of which has been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels.

Any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services.

A total of 8.1×10^6 m^3 per year (2.1×10^9 gal/yr) of water would be used to support all NTS programs under Alternative 4. This water would represent an irreversible and irretrievable commitment of this resource.

Electric usage would total 4.6×10^6 kW hrs/month, while fuel usage would total 461 m^3 per month (121,671 gal/month) that would represent an irreversible and irretrievable commitment of the energy resources.

A total of about 59,000 acres has been disturbed to date and approximately 14,400 more acres would be disturbed over the next 10 years. With the exception of some of the areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present and proposed use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

5.7.4.2 Tonopah Test Range. Much of the activity at the Tonopah Test Range takes place on the playas hence, surface disturbance would produce no effects on most other resources. No new surface disturbance would occur under Alternative 4. Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. Environmental restoration could involve several hundred acres, most of which has been previously disturbed. The amount that would be redisturbed during remediation depends first, upon the levels of contamination which would be determined during characterization and second, upon the agreements reached with the state of Nevada regarding cleanup levels. With the exception of some of the areas that would be remediated under the Environmental Restoration Program, most of the acres would be irreversibly and irretrievably committed to their

present use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.4.3 Project Shoal and Central Nevada Test Areas. About 10 acres at the Project Shoal Area and 40 acres at the Central Nevada Test Area would be disturbed through environmental remediation. Most of these areas were previously disturbed, so this would represent a setback in the ecological succession that has occurred. In addition, the subsurface area at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.4.4 Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. The irreversible and irretrievable commitment of resources resulting from the construction and operation of a Solar Enterprise Zone facility in Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley would be the same and are presented in this section. Ecological productivity would be greatly reduced or completely stopped during the period of time in which the plant is operating. The ecosystem's contribution would be irretrievably lost for that period of time and would likely never return to its present status.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Construction of roads in areas proposed for solar-generating facilities is likely to result in a greater incidence of vandalism and illicit artifact collecting within archaeologically sensitive areas. This could result in an irreversible and irretrievable loss of their information value.

The use of materials for construction would be an irretrievable and irreversible long-term commitment of the resources.

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Chapter 6

CUMULATIVE IMPACTS

CHAPTER 6
CUMULATIVE IMPACTS

This chapter is comprised of five sections: (1) definition of cumulative impacts, methods of analysis, analytical baseline, and information sources; (2) inventory and characterization of past, present, and reasonably foreseeable actions (including federal and non-federal actions); (3) summary of impacts attributable to implementation of the Nevada Test Site (NTS) alternatives; (4) cumulative impact analysis by resource area; and (5) a summary of cumulative impacts.

The U.S. Department of Energy (DOE) is currently planning or conducting a variety of Programmatic Environmental Impact Statements (EISs) that have the potential for impacting activities at the NTS. These activities are discussed in Chapter 2, Purpose and Need. The impact of actions proposed by the DOE in these Programmatic EISs is accounted for in the assessment presented in Chapter 5, Environmental Consequences. Impacts experienced at the NTS attributable to activities contained in Programmatic EISs prepared by agencies other than the DOE are not individually identified and specifically addressed in Chapter 5.

6.1 Definition of Cumulative Impacts, Methods of Analysis, Analytical Baseline and Information Sources

The following subsections provide the definition of cumulative impacts, and description of methods used in the analysis. Also included is the analytical baselines and a summary of the information sources used.

6.1.1 Definition

In accordance with the Council on Environmental Quality regulations, a cumulative impact analysis within an EIS includes the anticipated impacts to the environment resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time." (40 CFR Part 1508.7).

6.1.2 Methods of Analysis

A cumulative impact analysis is based on a number of assumptions. Cumulative impacts are examined by combining the impacts of the proposed program alternatives with the impacts of other past, present, and reasonably foreseeable activities in a region of influence. The extent of the region of influence can vary widely from one resource to another. For example, the region of influence for land use generally includes all impacts on land use in a broad region surrounding the area affected by the program alternatives. The region of influence for groundwater would generally be much smaller, encompassing only those groundwater-flow systems that are affected by the program alternatives, and by all past, present, and future actions that have or could affect these groundwater-flow systems. The region of influence for transportation could include an entire state, whereas the region of influence for socioeconomics could include all the cities and towns affected by the major economic activities in the region.

Public documents prepared by agencies of federal, state, and local government are the primary sources of information. It is assumed that actions undertaken by private persons and entities are captured in the information provided by such agencies.

The cumulative impacts methodology employs an approach that references resource management plans and economic and demographic projections as the sources of non-DOE-related baseline conditions. These plans provide an assessment of impacts to the environment associated with the implementation of these plans and scenarios. This approach is used rather than one that employs a compilation of specific future projects anticipated to occur in the respective regions of influence. In most cases the geographical areas in question are extensive and can

also contain large populations, making it infeasible to achieve a project-by-project aggregation.

Because of the wide geographic scope of a cumulative assessment and the variety of activities assessed, cumulative impacts are commonly examined at a less detailed level than are direct and indirect impacts.

The resource management plans and economic and demographic projections developed by public agencies present a consolidated picture of activities that are projected to occur in their respective geographical areas. In general terms, the resource management plans apply to large areas of relatively undeveloped land (virtually all of which is in federal ownership), and the economic and demographic projections apply to Clark and Nye counties, respectively.

6.1.3 Analytical Baseline

Except for the Las Vegas metropolitan area, southern Nevada is sparsely populated with large tracts of uninhabited desert and forested mountains controlled by a few federal agencies. Other land owners control relatively little land area.

FEDERAL LAND—The U.S. Bureau of Land Management controls the largest amount of land in the region. The U.S. Bureau of Land Management's lands are open to the public and are used chiefly for grazing and dispersed recreation; mineral exploration and mining have affected small areas. The U.S. Bureau of Land Management manages the Red Rock Canyon National Recreation Area 10 miles west of Las Vegas. The U.S. Bureau of Land Management also manages a few dozen areas surrounding the NTS and Nellis Air Force Range (NAFR) Complex as Wilderness Study Areas. The U.S. Bureau of Land Management has recommended to the Secretary of the Interior that some of these areas be included in the National Wilderness Preservation System.

The NAFR Complex, controlled by the U.S. Air Force, is the next largest block of land in the region. It surrounds the NTS on the north and east sides, and most of the west side (public lands border the NTS on its southern and southwestern sides). The NAFR Complex is used for military training and is closed to public access. The NTS is the next largest block of land in the region and is closed to public access. Combined, the NAFR Complex and the NTS form a single northwest-trending block of land that contains approximately 4,000,000 acres.

The U.S. Fish and Wildlife Service manages a large block of land north of Las Vegas as the Desert National Wildlife Range, and a smaller block of land 24 kilometers (km) (15 miles [mi]) south of the NTS as Ash Meadows National Wildlife Refuge. These lands are managed for wildlife conservation, with an emphasis on bighorn sheep in the Desert National Wildlife Range and pupfish in the Ash Meadows National Wildlife Refuge.

The National Park Service manages a large block of land bordering Lake Mead and the Colorado River as part of the Lake Mead National Recreation Area, and another block of land west of Beatty, Nevada, as part of Death Valley National Park. Lands controlled by the National Park Service are managed for conservation and recreation.

The U.S. Forest Service manages a single segment of land west of Las Vegas as part of the Toiyabe National Forest. Other U.S. Forest Service lands are located just north of Tonopah. U.S. Forest Service lands are used chiefly for recreation.

AMERICAN INDIAN LAND—The Moapa River Indian Reservation is 48 km (30 mi) northeast of Las Vegas and is the largest reservation in the region. Other reservations include the Las Vegas Indian Reservation, which is located about 24 kilometers (15 miles) northwest of Las Vegas, and the Fort Mojave Indian Reservation at the southern tip of Clark County. Within this region, there also are several Indian reservation schools, tribal enterprises, tribally controlled schools, tribal police departments, and tribal emergency response units. The following reservations are located within the region: Duckwater Shoshone Tribe, Las Vegas Paiute Tribe, Moapa Paiute Tribe, and the Yomba Shoshone Tribe. In addition, there are tribes which are located geographically outside of the region, but are potentially impacted by NTS activities. (One of these tribes is the Timbisha Shoshone Tribe, based in Death Valley, California and is located closer to the Nevada Test Site than many towns in northern Nye County). As a consequence of this proximity,

people from the Timbisha Shoshone Tribe, are a part of the social and economic region of influence of the NTS. For example, students from the Timbisha Shoshone Tribe attend public school in Beatty, Nevada, whereas many Shoshone students from Tecopa, California attend school in Pahrump, Nevada. Timbisha tribal members both work and shop in Clark and Nye counties.

The Pahrump Paiute Tribe, located in Pahrump Valley, is composed of Indian people who have been historically recognized by state and federal agencies as qualified to receive services as Indian people, and who as a group are currently seeking federal acknowledgment.

STATE LAND—The state of Nevada manages the Valley of Fire State Park. This park is used for recreational purposes and is located about 64 km (40 mi) northeast of Las Vegas. Other small parcels of undeveloped state lands are scattered throughout the region.

PRIVATE LANDS—The Las Vegas Valley and nearby Boulder City contain the single largest block of private land in the region. Pahrump Valley, located about 32 km (20 mi) south of the NTS, also contains large amounts of private land, but relatively little of this land has been developed. Large blocks of private land occur also in the Overton area at the north end of Lake Mead, in Coyote Spring Valley immediately east of the Desert National Wildlife Range, and in the Amargosa Desert, 16 km (10 mi) northwest of Ash Meadows National Wildlife Refuge. These lands are used chiefly for agriculture, with smaller amounts dedicated to residential and business development. Other small blocks of private agricultural lands are scattered around many of the small communities in the region.

6.1.4 Information Sources

Resource management plans, and EISs associated with their implementation, have been prepared by the U.S. Bureau of Land Management for the NAFR Complex (BLM, 1990) and the Stateline and Tonopah resource areas (BLM, 1994a; 1994b) near the NTS. A framework for a resource management plan has been prepared for the NTS and is included as Volume 2 of the NTS EIS. Such plans are designed to guide and control future management actions, including the development of limited and more detailed plans for specific resources and land uses. Resource management plans identify objectives for each resource area, management direction designed to attain these objectives, and restricted land-use designations associated with the management direction (where appropriate).

The resource categories commonly considered in resource management plans, include air, soils, water, vegetation, riparian, visual, fish and wildlife habitat, forestry, livestock grazing, wild horses and burros, cultural and paleontological, lands, natural areas, recreation, wild and scenic rivers, rights-of-way, minerals, fire management, and socioeconomic values.

The resource management plans and economic and demographic projections for the following geographic areas are:

- U.S. Bureau of Land Management Tonopah Resource Area
- U.S. Bureau of Land Management Stateline Resource Area
- Nellis Air Force Range
- Clark County Region Economic and Demographic Projections
- Nye County Economic and Demographic Projections.

6.2 Past, Present, and Reasonably Foreseeable Future Actions

In the following subsections, the past, present, and reasonably foreseeable future action of federal agencies, non-federal (public and private) entities, and American Indian Tribes, which contribute to the cumulative impacts, are presented.

6.2.1 Past and Present Actions

Past and present actions associated with activities of the DOE and other public and private entities are included in the baseline conditions described in Chapter 4, Affected Environments.

6.2.2 Reasonably Foreseeable Future Actions

Reasonably foreseeable future projects are presented below under the following three categories: federal, non-federal (public and private), and American Indian. Following the description of plans and programs, the relationships between their implementation and potential environmental impacts (by resource area) are presented.

FEDERAL ACTIONS—Actions of agencies of the federal government included in this section are those of the DOE, U.S. Air Force, Department of the Interior (U.S. Bureau of Land Management and U.S. Fish and Wildlife Service), and U.S. Navy.

U.S. DEPARTMENT OF ENERGY—Site characterization studies at Yucca Mountain in Nye County, Nevada, are ongoing and designed to determine whether the site is suitable for the storage and isolation of high-level radioactive waste and spent nuclear fuel. Activities being carried out include surface-based studies, underground studies, laboratory tests, modeling, and various associated analyses. The purpose of these studies and tests is to determine whether (1) a geologic repository can be constructed and operated at the site in such a way that the health and safety of the public and workers are protected and (2) nuclear waste emplaced in a repository will remain isolated from the accessible environment.

The DOE anticipates making a recommendation to the President on the suitability of Yucca Mountain for the disposal of spent nuclear fuel and high-level radioactive waste in 2001. If found suitable, a license application for construction of the repository would be submitted to the Nuclear Regulatory Commission in 2002. Construction of the repository would only begin after the Nuclear Regulatory Commission grants a construction license. It is anticipated that construction would be complete and the repository would start operations in 2010.

In support of the process that led to the recommendation of the Yucca Mountain site as the location where site characterization activities would be carried out, the DOE prepared a site-specific Environmental Assessment (DOE, 1986). This document concluded that no significant adverse environmental impacts were expected from site characterization activities carried out at the Yucca Mountain site. Environmental impacts associated with site characterization activities are monitored and outlined in detail in an annual Site Environmental Report. Such reports have been prepared for calendar years 1991, 1992, 1993, and 1994 (DOE, 1992a; 1993; 1994a; 1995f). Until 1994, with the positioning of the tunnel-boring machine in the starter tunnel, the main focus of site characterization was on surface activities. During the entire period covering site characterization activities, the DOE has complied with all environmental requirements and permit conditions. In addition, numerous monitoring activities have been carried out, especially in the areas of radiological field studies, air quality, meteorology, cultural resources (archaeological and American Indian), water resources, and terrestrial ecosystems.

No significant adverse impacts are anticipated as a result of site characterization activities. According to the 1986 Yucca Mountain Environmental Assessment, limited impacts are expected to occur in the following resource areas: approximately 704 acres of surface soils will be disturbed, wildlife habitat will be disturbed, air quality will be affected through the generation of particulate and gaseous emissions, noise effects will temporarily impact sensitive receptors (wildlife), impacts to aesthetics will result from the construction of access roads; and additional trips on U.S. Highway 95 will occur but are not expected to affect the current level of service.

Estimates of these impacts are described in the Environmental Assessment. Annual monitoring, as described in the Site Environmental Reports, is conducted to ensure that impacts associated with site characterization activities remain well within the levels projected in the Environmental Assessment. Certain mitigation actions, including reclamation of disturbed lands, studies of the desert tortoise and its habitat, and archaeological monitoring, have been implemented as part of the site characterization program. (Areas scheduled for ground disturbance are also surveyed in advance to determine the presence of cultural and biological resources and appropriate mitigation measures, such as avoidance or collection of resources). Mitigation activities required as part of applicable site permits,

such as dust suppression in conformance with air quality permits, are also implemented.

The cumulative impacts from site characterization activities at Yucca Mountain, added to the impacts anticipated from implementation of program alternatives analyzed in this EIS, are expected to be minimal. Because most of these anticipated impacts will occur on the NTS, the cumulative contribution to off-site, regional conditions is expected to be negligible. In addition, given the recent reductions in weapons testing activity at the NTS, cumulative impacts would be expected to have declined during the period of site characterization activities. Further discussion regarding potential cumulative impacts to specific resource areas and the general population can be found in Section 6.4, and are summarized in Table 6-1.

U.S. AIR FORCE.—The major land area associated with activities conducted at the Nellis Air Force Base is that of the NAFR Complex. The NAFR Complex comprises 3,035,326 acres (of which 826,000 acres are administered by the U.S. Fish and Wildlife Service as the Desert National Wildlife Range) located in south-central Nevada. Included in the NAFR Complex are about 123 acres of private land (patented mining claims).

Environmental concerns that could contribute to cumulative impacts in a resource region of influence are addressed in the *Nellis Air Force Range Proposed Resource Plan and Final Environmental Impact Statement* (BLM, 1990). Two alternatives were identified in the *Resource Management Plan* and selected for detailed analysis. They were (1) No Action Alternative, or a continuation of current management direction within the framework of present laws and regulations, and (2) Preferred Alternative which is designed to improve rangeland vegetation conditions and wildlife habitat by achieving and maintaining the appropriate management level of the wild horse population in the planning area. Four major issues were identified for consideration: (1) vegetation, (2) wildlife habitat, (3) wild horse and burro management, and (4) cultural resources.

In addition to operational activities associated with the NAFR Complex, other potential actions include return of approximately 7,200 to 7,500 acres of NAFR Complex lands to the U.S. Bureau of Land Management (Donegan, 1995). It is anticipated that property currently managed by the Nellis Air Force Base will be returned to the U.S. Bureau of Land Management. The property is comprised of approximately 4,800 acres within the old small arms range located west of the Nellis Air Force Base near Interstate 15 and less than 3,000 acres located west of the Indian Springs Auxiliary Airfield.

U.S. BUREAU OF LAND MANAGEMENT.—Resource management plans, and EISs associated with their implementation, have been prepared by the U.S. Bureau of Land Management for the Stateline and Tonopah resource areas.

The Stateline resource area comprises 3.7 million acres of public land in Clark and Nye counties. The resource area is bordered by the Caliente resource area, the U.S. Fish and Wildlife Service, the Desert National Wildlife Range, the NAFR Complex, and the NTS.

Table 6-1 Population projections

County	Year 2000	Year 2005
Clark County		
NTS EIS	1,223,541	1,380,920
Clark County Regional Transportation Plan	1,130,000	1,289,000
Clark County Desert Conservation Plan	1,088,197	1,205,070
Nye County	33,966	38,516

The *Resource Management Plan* (BLM, 1992) provides a detailed characterization of five resource management plans (Alternatives A through D and the No Action Alternative). Alternative D is the Bureau of Land Management's Preferred Alternative. Following public and agency review of the draft version of the NTS EIS, an additional alternative was developed (Alternative E) and a Supplemental EIS was issued in 1994 (BLM, 1994a). The alternatives are as follows:

- No Action Alternative—This represents a continuation of current management direction within the framework of present laws and regulations, including existing Memoranda of Understanding and Cooperative Agreements. The No Action Alternative also provides a baseline against which the environmental effects of implementing other alternatives are compared.

- Alternative A –This Alternative is designed to provide for a full spectrum of public land uses in the traditional sense of multiple-use and sustained yield. Consumptive and non-consumptive uses would be balanced.

- Alternative B—This alternative attempts to provide maximum opportunities for land-based growth and development needs of the state of Nevada while continuing to provide for multiple-use and sustained yield of the public lands.

- Alternative C—This alternative provides for the management of the public lands on an ecosystemic basis, with an emphasis on biodiversity, nonconsumptive uses, and the protection and recovery of the desert tortoise.

- Alternative D—This alternative is the U.S. Bureau of Land Management's Preferred Alternative and would continue to allow for the multiple-use of the public lands, permit maximum flexibility in the disposal of public lands, and provide for the protection and recovery of the desert tortoise.

- Alternative E—This alternative proposes management direction to provide for public land uses on the basis of multiple-use and sustained yield, while emphasizing biodiversity and the protection and recovery of the threatened desert tortoise.

The *Resource Management Plan*/EIS focuses on 10 management issues, each of which is incorporated in the alternative plans under assessment. The identified issues are as follows:

1. Land Tenure
2. Desert Tortoise
3. Mineral Development
4. Off-Highway Vehicle Use
5. Special Management Areas and Areas of Critical Environmental Concern
6. Utility Corridors
7. Rangeland Classification
8. Utility Corridor Locations and Widths
9. Minerals Management and Post Congressional Non-designation of Wilderness Study Areas
10. Desert Tortoise Habitat Management in Conformance with the Recovery Plan for the Desert Tortoise (Mojave Population).

The potential environmental consequences in each of the resource areas are assessed from a number of perspectives. For example, effects on air resources are assessed from the perspective of land management, recreation management, and minerals management. The effects on soils are addressed from the perspectives of livestock grazing management, recreation management, rights-of-way management, and minerals management. The effects (quantified in terms of disturbed land area) attributable to reasonably foreseeable future actions are identified in the *Supplement to the Stateline Draft Resource Management Plan and EIS (BLM, 1994a)*.

The total area potentially disturbed over the 10-year period could reach approximately 197,000 acres.

The Tonopah resource area encompasses 6.1 million acres of land in Nye and Esmeralda counties of central Nevada. Significant resources and program emphases include locatable minerals, livestock grazing, wild horses and burros, real estate, cultural resources, and wildlife.

Four detailed alternative management scenarios were analyzed in the NTS EIS (BLM, 1994b) which aim at resolving six major issues:

- Alternative 1 (No Action Alternative)— This alternative represents a continuation of management under existing planning guidance and also provides a baseline against which the potential environmental impacts associated with implementation of the other alternatives are compared.

- Alternative 2—This alternative provides management with an emphasis on private economic development and economic diversity through the use of a wide range of resources. Lands will be made available for expansion and development while protecting sensitive resources.

- Alternative 3—This alternative provides for private economic development and economic diversity which are constrained by environmental safeguards designed for the preservation and enhancement of environmental systems, and for species diversity.

- Alternative 4—This alternative is the preferred alternative and it provides for the development of renewable and nonrenewable resources while ensuring that the preservation and enhancement of fragile and unique resources will occur.

The issues addressed in the *Tonopah Resource Management Plan* and accompanying EIS are outlined below:

1. Wild horses and burros (determine what intensity of management should be implemented to ensure a thriving natural ecological balance)

2. Special management areas (determine if lands should be given special management to protect high resource values)

3. Off-highway vehicle use (determine if lands should be limited or closed)

4. Management of released wilderness study areas (determine what objectives should be established for areas now designated by Congress as nonwilderness)

5. Utility corridors (determine lands for preferred routes for utility corridors and to minimize conflicts)

6. Locatable and fluid minerals (determine lands for closure to leasing or location of minerals, and lands for special considerations).

The total area potentially disturbed over the 10-year period could reach approximately 26,800 acres.

U.S. FISH AND WILDLIFE SERVICE—Approximately 28 bighorn sheep were recently introduced into the Spotted Range of the Desert National Wildlife Range. Their introduction involved the construction of two water developments (wildlife guzzlers), and a third is planned for the future. These water developments comprise two or three water tanks (11,356 to 15,141 liters [3,000 to 4,000 gallons] each), a surface water collection apron, and a drinking device. Potential impacts to biological resources would be minor.

U.S. NAVY—The U.S. Navy proposes to withdraw 189,000 acres of U.S. Bureau of Land Management land in Churchill County around existing training ranges to accommodate increased levels of flight training activity at Naval Air Station Fallon. The action is referred to as the Master Land Withdrawal. The objectives of the proposed action are fourfold: (1) meet training requirements for national defense, (2) fulfill established operation and Range Air Installation Compatibility Use Zone safety guidelines, (3) facilitate protection of the public from off-range ordnance, and (4) provide for continued public access to and safety on public lands adjacent to the military withdrawals. The withdrawn land would be managed for military

purposes for a proposed term of 20 years. A Resource Management Plan will be developed for the withdrawn lands to provide for public safety by defining public uses compatible with military training operations (McMillan, 1995).

A number of sensitive issues were identified prior to scoping. They include land use (including public recreational uses), public health and safety, cultural resources, and unexploded ordnance on withdrawn lands. The principal concern is the proposed withdrawal of land. This potential issue is of a statewide nature and is not directly related to NTS programs.

NON-FEDERAL ACTIONS—This section includes information from the following public entities: state of Nevada, Clark County, and Nye County. Activities that would likely take place within the incorporated places of both Clark and Nye counties are assumed under the economic and demographic growth projections presented for each of the counties.

STATE OF NEVADA –Virtually all state involvement in development activities in the region involve regional transportation. This area of concern, and others related to it, are addressed under county governmental entities.

CLARK COUNTY—The Regional Transportation Plan for Clark County (Regional Transportation Commission, 1994) documents an average annual rate of population growth over the period 1980 to 1990 of 5.2 percent, and 5.7 percent for employment. The respective growth rates over the period 1990 to 2000 are projected to be 3.9 percent for population and 4.6 percent for employment. Over the period 2000 to 2015, these growth rates fall to 2.5 percent for both population and employment.

A number of factors will influence the rate of future development in the Las Vegas Valley. They include, but are not limited to, the availability of water, air quality, the strength of the tourism industry (the gaming sector in particular), the cost of housing, and the disposal of public lands making areas available for urban development.

Population projections for Clark County anticipate a population of between 1.1×10^6 and 1.2×10^6 persons by the year 2000. Population is expected to rise to between 1.2×10^6 and 1.4×10^6 persons by the year 2005 (see Table 6-1). It is further projected that approximately 58,000 acres of undeveloped land, in the Las Vegas Valley, will be converted to urban uses between 1996 and the year 2005. (See Table 6-2).

CLARK COUNTY DESERT CONSERVATION PLAN—The Clark County Desert Conservation Plan (Regional Environmental Consultants, 1995) was prepared for two reasons: (1) support an application for a Section 10(a) incidental take permit under the Endangered Species Act applicable to the desert tortoise, and (2) outline a strategy that will allow Clark County (as well as state and federal resource managers) to address the conservation and protection of habitat necessary to preserve other plant and wildlife resources to avoid the need for listing those species.

The incidental take of desert tortoises applies to an area of approximately 525,000 acres which comprises all non-federal land in Clark County and on approximately 2,900 acres of desert tortoise habitat associated with the Nevada Department of Transportation activities (rights-of-way and material sites) in Clark, Esmeralda, Lincoln, and Nye counties.

Over the permit period (30 years), it is estimated that about 114,000 acres of land (111,000 acres in Clark County and 2,900 acres in Nevada Department of Transportation rights-of-way and material sites) will be developed, most of which is desert tortoise habitat. In order to offset this destruction of desert tortoise habitat, the Desert Tortoise Recovery Plan proposed six distinct population segments or recovery units within the range of the Mojave population of the desert tortoise. Each recovery unit includes one or more Desert Wildlife Management Areas. The Desert Wildlife Management Areas that fall primarily in Clark County are Paiute-Eldorado, Coyote Spring, Gold Butte, and Mormon Mesa. The recovery units are located in areas of prime desert tortoise habitat

Table 6-2. Land area disturbed (acres)

Locality	Disturbed Area
Stateline Resource Area	197,000
Tonopah Resource Area	26,800
Las Vegas Valley	58,000
Nye County	2,100
Total	283,900

and are subject to a number of land-use constraints designed to optimize the survival and recovery of the desert tortoise in these areas. Funding for the program is derived mainly from the imposition of a $500-per-acre mitigation fee on development projects in the permit area.

NYE COUNTY—Several key economic and demographic forces influence future activities and the character of Nye County and the communities contained in it. They include the NTS, Tonopah Test Range, mining activity, tourist activity, commuting, migration patterns, local service sector activity, and demographic factors.

Baseline population projections prepared for the county (Nye County Board of Commissioners, 1993) indicate an average annual compound growth rate of 4.6 percent for the entire county over the period 1990 to 2010. However, this population increase is highly localized and concentrated in the Pahrump area. It is projected that this area will experience a growth rate of 7.6 percent annually over the time period. The share of total county population located in Pahrump is projected to increase from 42 percent in 1990 to 74 percent in 2010. This urbanization trend will entail the conversion of land currently in an undeveloped state. It is anticipated that over 2,000 acres of land will be converted to urban uses by the year 2005 (see Table 6-2). The rapid urban development occurring in Pahrump is fueled by the low cost of land, proximity to the Las Vegas metropolitan region, and relocation of retirees. This residential activity, in turn, creates development and construction of service activities and infrastructural improvements.

AMERICAN INDIAN ACTIONS—The following American Indian tribal organizations and representatives have been contacted: Pahrump Paiute Tribe, Pahrump, Nevada; Las Vegas Paiute Tribe, Las Vegas, Nevada; Moapa Paiute Tribe, Moapa, Nevada; Kaibab Paiute Tribe, Glendale, Arizona; Las Vegas Indian Center, Las Vegas, Nevada; Owens Valley Paiute Tribe, Lone Pine, California; Yomba Shoshone Tribe, Austin, Nevada; and Duckwater Shoshone Tribe, Duckwater, Nevada.

Information regarding reasonably foreseeable future actions was received from the Las Vegas Paiute Tribe. Plans have been developed for the construction of a destination resort to be located on the east side of the reservation fronting U.S. Highway 95. The core of the resort area will encompass 150 acres and will include a 450-room hotel/casino and four championship golf courses. A 300-acre theme park will be built next to the resort area. On the west side of the reservation, a planned development includes 200 single-family homes for tribal members, a laundry plant, a 20-mw solar park, and a solar research center. The Bureau of Indian Affairs has prepared an Environmental Assessment for the construction of the four golf courses.

6.3 Nevada Test Site Program Alternatives

A summary of the anticipated impacts associated with implementing each of the program alternatives, on a resource-specific basis, is presented in Table 3-5. An inspection of this table reveals minimal impact from new programs or projects at the NTS over the 10-year period. In general, the level of intensity of impacts declines from those projected under Alternative 1 (No Action) for those

under Alternative 2 (Discontinue Operations) and Alternative 4 (Alternative Use of Withdrawn Lands). The intensity of potential impacts associated with implementation of Alternative 3 (Expanded Use) is expected to be higher than under Alternative 1 (No Action). Potential impacts to the three areas associated with the Solar Enterprise Zone facility (Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley) represent new rather than incremental potential impacts as is the case of the NTS, the fourth Solar Enterprise Zone facility area.

6.4 Cumulative Impact Analysis

Most of the land near the NTS is held in public ownership by the U.S. Bureau of Land Management (contained in the Stateline and Tonopah resource areas, respectively), the U.S. Air Force (NAFR Complex), and the U.S. Fish and Wildlife Service (Desert National Wildlife Range), while much of the land in the Las Vegas Valley is privately owned and undergoing widespread and rapid conversion to urban uses. The following assessment of cumulative impacts associated with reasonably foreseeable future actions is based on information presented in EISs prepared by the U.S. Bureau of Land Management for the Stateline and Tonopah resource areas, an EIS prepared for the Resource Plan at the NAFR Complex, a general development scenario applicable to private lands in the Las Vegas Valley section of Clark County, and economic and demographic projections prepared by both Clark and Nye counties.

It is likely that large areas of land will be disturbed throughout the entire region because of changes in use. These changes include urban development, development of mineral resources, the opening of areas for recreational use, and development of utility easements. The vast majority of the projected urban development will occur in areas adjacent to the Las Vegas urban area; additional rapid development will be localized in southern Nye County.

It is projected that approximately 284,000 acres of land could be disturbed within the region during the 10-year period. Of this total, about 58,000 acres would be located in the Las Vegas Valley. The general location of this disturbance is presented in Table 6-2. Much of the land disturbance in the Las Vegas Valley and southern Nye County is attributable to the conversion of land from non-urban to urban uses in the Las Vegas metropolitan area of Clark County and around Pahrump in Nye County. A series of population projections exist for Clark County as seen in Table 6-1. For purposes of this analysis, the higher projections are used.

6.4.1 Land Use

It is anticipated that the major land-use designations and land users within the region will remain unchanged through the foreseeable future. Under Alternative 4, some NTS land could be returned to the U.S. Bureau of Land Management. This action, along with the possible return of small tracts of U.S. Air Force land to the public, would increase the amount of public land in this area. However, the NTS (and the NAFR Complex) would continue to form a large, continuous block of land closed to the public.

It is likely that, over the next decade, Congress will designate some U.S. Bureau of Land Management lands in southern Nevada for inclusion in the National Wilderness Preservation System. Management and use of these wilderness areas would be similar to their current management and use as wilderness study areas. Wilderness study areas not included in the National Wilderness Preservation System will be released for general use, thereby increasing the types of activities that can be conducted by the public on thousands of acres of U.S. Bureau of Land Management land.

Rapid urbanization in Las Vegas and its vicinity, and the potential sale of U.S. Bureau of Land Management land to accommodate this growth, would reduce the acreage of public-owned lands in this area.

Under Alternative 3, defense-related aircraft operations within the DOE and NAFR Complex airspace would increase gradually over a 10-year period. This increase and the expected increases in civilian aviation activities would not have an adverse cumulative impact on airspace use in southern Nevada. The majority of DOE and the Department of Defense (DoD) aircraft transiting to and from the DOE and NAFR Complex airspace use corridors that do not conflict with those routes

flown by commercial aircraft between Las Vegas and other key cities.

6.4.2 Transportation

An increase of 1,030 one-way vehicle trips generated by an additional 4,400 workers employed at the NTS in 2005 under Alternative 3 (Expanded Use Alternative) would contribute negligible amounts to approximately 4.0×10^6 daily vehicle trips projected for the year 2005 by the Regional Transportation Plan (Regional Transportation Commission, 1994). The Regional Transportation Commission of Clark County has been actively engaged in highway improvement programs to relieve traffic congestion and reduce traffic accidents in Clark County.

TRANSPORTATION OF RADIOACTIVE MATERIALS—The cumulative impacts of the transportation of radioactive material consist of impacts from (1) historical shipments of radioactive waste and spent nuclear fuel to the NTS, (2) other historical shipments, (3) contributions made by the alternatives evaluated in the NTS EIS, (4) reasonably foreseeable actions that include transportation of radioactive material, and (5) transportation of general radioactive materials that are not related to a particular action.

The Yucca Mountain Repository EIS will consider other relevant transportation information and analyses, including the NTS EIS and other EISs prepared by the DOE to address other proposed actions. The Yucca Mountain Repository EIS will incorporate information from the NTS EIS, as appropriate, in its description of the existing environment as well as in its analysis of cumulative impacts. In this way, the DOE will ensure that the cumulative effects from all activities taking place or contemplated at the NTS are considered in its decisionmaking process, along with the public's comments on these activities.

The assessment of cumulative transportation impacts concentrates on the cumulative impacts of off-site transportation, because off-site transportation yields potential radiation doses to a greater portion of the general population than does on-site transportation. The collective dose to the general population and workers is the measure used to quantify cumulative transportation impacts. This measure of impact was chosen because it may be directly related to latent cancer fatalities using a cancer risk coefficient and because of the difficulty in identifying a maximally exposed individual for shipments throughout the United States spanning the period 1951 (the year corresponding to the start of operations at the NTS) through 2005, a 55-year period.

1. Historical Shipments to NTS

Collective doses from historical shipments of spent nuclear fuel to the NTS were summarized in Jones and Maheras (1994). Data for these shipments were available for 1971 through 1993 and were linearly extrapolated back to 1951 because data prior to 1971 were not available. The results of this analysis are summarized in Table 6-3.

Other collective doses from historical shipments of low-level waste, low-level mixed waste, and transuranic waste to the NTS were also estimated. From 1974 through 1994, there were about 8,400 of these shipments. The results of this analysis are also summarized in Table 6-3.

2. Other Historical Shipments

Collective doses from other historical shipments of radioactive material were evaluated in DOE (1995a). These include historical shipments associated with the Idaho National Engineering Laboratory, the Savannah River Site, the Hanford Site, the Oak Ridge Reservation, and Naval spent nuclear fuel and test specimens. The results of these analyses are summarized in Table 6-3.

3. Shipments for NTS Alternatives

The collective doses for radioactive waste shipments associated with the alternatives evaluated in this EIS are summarized in Volume 1, Appendix I of the NTS EIS. The number of waste shipments from off-site generators ranges from none in Alternative 2, Discontinue Operations, to about 40,000 shipments in Alternative 3, Expanded Use. The range of collective doses estimated to result from these shipments is summarized in Table 6-3.

4. Reasonably Foreseeable Actions

Transportation impacts may also result from reasonably foreseeable projects taking place within

Table 6-3. Cumulative transportation-related radiological collective doses and latent cancer fatalities (1951 to 2005) (Page 1of 2)

Category	Collective occupational dose (person-rem)	Collective general population dose (person-rem)
1. Historical shipments to the NTS		
Spent nuclear fuel (Jones and Maheras, 1994)	1.4	0.70
Radioactive waste	82	100
2. Other historical shipments (DOE, 1995a)	250	130
3. Shipments for alternatives evaluated in the NTS EIS	d	0.0 to 154.0[f]
4. Reasonably foreseeable actions		
Spent nuclear fuel management (DOE, 1995a; 1996a)	360	810
Waste Isolation Pilot Plant (DOE, 1994b)	2,900	8,400
Molybdenum-99 production (DOE, 1996b)	240	520
Tritium supply and recycling (DOE, 1995b)	--	--
Waste Management Programmatic EIS (DOE, 1995c)[e]	16,000	20,000
Surplus highly enriched uranium disposition (DOE, 1995d)	1,100	1,200
Storage and Disposition of Fissile Materials (DOE, 1996c)	--	2,400.0[g]
Stockpile Stewardship (DOE, 1996d)	--	170.0[h]
Container system for Naval spent nuclear fuel (USN, 1996)	18	24
Pantex (DOE, 1996e)	250.0[i]	490.0[i]
West Valley (DOE, 1996f)	1,400	12,000
Submarine reactor compartment disposal (USN, 1984)	--	0.053
Return of Cs-137 capsules (DOE, 1994c)	0.42	5.7
Uranium billets (DOE, 1992b)	0.50	0.014
Nitric acid (DOE, 1995e)	0.43	3.1
5. General transportation		
1951 to 1982	180,000	130,000
1983 to 2005	39,000	42,000

Table 6-3. Cumulative transportation-related radiological collective doses and latent cancer fatalities (1951 to 2005) (Page 2of 2)

Summary		
Historical	330	230
Shipments for alternatives evaluated in the NTS EIS	d	154
Reasonably foreseeable actions	22,000	46,000
General transportation (1951 to 2005)	220,000	170,000
Total collective dose	240,000	220,000
Total latent cancer fatalities	96	110

[a] Includes low-level mixed waste and low-level waste; transuranic waste included in DOE (1995c)
[b] Includes public and occupational collective doses
[c] Includes all highly enriched uranium shipped to Y-12
[d] Collective occupational dose included in the total for collective general population dose

the timeframe of the NTS EIS (1996 to 2005), such as the transportation impacts contained in other DOE National Environmental Policy Act analyses.

- Shipments associated with the DOE Tritium Supply and Recycling Program
- The shipment of radioactive and hazardous wastes associated with the DOE Waste Management Program
- Shipments associated with the disposition of surplus highly enriched uranium
- Shipments associated with the storage and disposition of weapons-usable fissile materials
- The shipment of Defense Program materials associated with the DOE Stockpile Stewardship and Management Program
- Shipments of spent nuclear fuel associated with a proposed container system for Naval spent nuclear fuel
- Shipments of Defense Program materials associated with continuous operation of the Pantex Plant
- Shipments of radioactive waste associated with the West Valley Demonstration Project.

The results of these analyses are summarized in Table 6-3. For many of these analyses, a preferred alternative was not identified nor has a Record of Decision been issued. In those cases, the alternative that was estimated to result in the largest transportation impact was included in Table 6-3. It should be noted that although the DOE is presently determining the suitability of Yucca Mountain, Nevada, as a site for a geologic repository for spent nuclear fuel and high-level waste, these shipments were not included in this analysis because they are scheduled to start in 2010, which is outside the timeframe evaluated in this EIS.

There are also reasonably foreseeable projects that involve limited transportation of radioactive material: (1) shipment of submarine reactor compartments from the Puget Sound Naval Shipyard to the Hanford Site for burial, (2) return of cesium-137 isotope capsules to the Hanford Site, (3) shipment of uranium billets from the Hanford Site to the United Kingdom, and (4) shipment of low specific activity nitric acid from the Hanford Site to the United Kingdom. The results of these analyses are summarized in Table 6-3. While this is not an exhaustive list of projects that may involve limited transportation of radioactive material, it does illustrate that the transportation impacts associated with these types of projects are extremely low when compared to major projects or general transportation.

5. General Transportation

General transportation activities also take place that are unrelated to the alternatives evaluated in the NTS EIS or to reasonably foreseeable actions. Examples of these activities are shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level waste to commercial disposal facilities. The U.S. Nuclear Regulatory Commission evaluated these types of shipments based on a survey of radioactive materials transportation published in 1975 (NRC, 1977). Categories of radioactive material evaluated in the U.S. Nuclear Regulatory Commission document (1977) included limited quantity shipments, medical, industrial, fuel cycle, and waste shipments.

Because comprehensive transportation doses were not available, collective dose estimates derived from transportation dose assessments in the U.S. Nuclear Regulatory Commission document (1977) were used to estimate transportation collective doses for 1951 through 1982 (32 years). These dose estimates included spent nuclear fuel and radioactive waste shipments made by truck and rail. The cumulative transportation collective doses for 1951 through 1982 are summarized in Table 6-3. The cumulative transportation doses for 1983 through 2005 are also summarized in Table 6-3.

The total worker and general population collective doses are summarized in Table 6-3. Total collective worker doses from all types of shipments (historical, the alternatives, reasonably foreseeable actions, and general transportation) were estimated to be 240,000 person-rem (96 latent cancer fatalities) for the period 1951 through 2005 (55 years). Total general population collective doses were estimated to be 220,000 person-rem (110 latent cancer fatalities). The majority of the collective dose for workers and the general population was because of general transportation of radioactive material. The total number of latent cancer fatalities over the period 1951 through 2005 was estimated to be 210. Over this same period (55 years), approximately 27,000,000 people would die from cancer, based on 510,000 latent cancer fatalities per year (U.S. Bureau of the Census, 1993). The estimated number of transportation-related latent cancer fatalities attributable to NTS alternatives would be indistinguishable from other latent cancer fatalities, and the transportation-related latent cancer fatalities attributable to NTS alternatives would be 0.0008 percent of the total number of latent cancer fatalities.

VEHICULAR ACCIDENT IMPACTS— Fatalities involving the shipment of radioactive materials were surveyed for 1971 through 1993 using the Radioactive Material Incident Report database. For 1971 through 1993, 21 vehicular accidents involving 36 fatalities occurred. These fatalities resulted from vehicular accidents and were not associated with the radioactive nature of the cargo. No radiological fatalities because of transportation accidents have ever occurred in the United States. During the same period, over 1,000,000 persons were killed in vehicular accidents in the United States.

For the alternatives evaluated in the NTS EIS, zero to eight vehicular accident fatalities are estimated to occur. During the 10-year period from 1996 through 2005, approximately 400,000 people would be killed in vehicular accidents in the United States. The vehicular accident fatalities associated with NTS radioactive waste shipment would be 0.002 percent of the total vehicular number accident fatalities. Activities related to the NTS would not measurably increase regional vehicular fatalities.

6.4.3 Socioeconomics

Cumulative socioeconomic impacts are defined as impacts generated by NTS activities under Alternative 3 (Expanded Use), which represents maximum impacts, added to the impacts generated by all economic activities projected for Clark and Nye counties in the year 2005. Employment and population projections embracing all economic activities including the continuation of current NTS-related activities as described under Alternative 1 were based on Economic Outlook (Schwer, 1995) and Draft Baseline Economic and Demographic Projections: 1990-2010 (Nye County Board of Commissioners, 1993). Impacts on selected socioeconomic indicators are presented in Table 6-4. Employment associated with activities at the NTS under Alternative 3 would contribute 2 percent of the projected employment level in

Table 6-4. Cumulative socioeconomic impacts

Socioeconomic Indicators	NTS Activities (Alternative 3) 2005	All Other Economic Activities 2005	Cumulative Impacts 2005	Percent Change (attributable to NTS activities)
Clark County				
Total Jobs	12,857.00	650,413.00	663,270.00	2.00
Personal Income ($million)	633.00	32,281.00	32,914.00	2.00
Population	10,020.00	1,380,920.00	1,390,940.00	0.70
Unemployment Rate (percent)	(1.10)	5.80	4.70	Not Applicable
Nye County				
Total Jobs	516.00	15,445.00	15,961.00	3.30
Personal Income ($million)	31.00	781.00	812.00	4.00
Population	656.00	38,516.00	39,172.00	1.70
Unemployment Rate (percent)	(0.50)	5.20	4.70	Not Applicable

Clark County in the year 2005 and reduce the projected unemployment rate by just over one percentage point. Although the total number of jobs held by residents of Nye County are significantly less than those held by Clark County residents, they correspond to 3.3 percent of the projected labor force in the year 2005. This NTS-related employment will reduce the unemployment rate by one half of one percentage point.

Under Alternative 2 there would be a reduction in employment at the NTS. There would be a reduction of almost 750 jobs held by Nye County residents which represents 5.5 percent of the projected labor force in 1997, the year when minimal site employment levels are reached.

Given the considerable growth of the economies of both Clark and Nye counties, it is estimated that increases or decreases of the magnitude referenced above will not severely impact the ability of county government to provide adequate public services to their residents. No fiscal impacts to cities and counties are anticipated.

6.4.4 Geology and Soils

Actions related to underground testing would add incrementally to the levels of subsurface contamination in underground nuclear zones. For tests conducted more than 100 m (328 ft) above the water tables, there would be an incremental increase in the deposition of radioactive materials in the subsurface and the activation of naturally occurring elements bound in the rock in the near test environments. Underground subcritical dynamic experiments would result in incremental increases in the deposition of radioactive material in the mined cavities of the Lyner Complex. The land surface would be unaffected by these experiments.

Excavation of contaminated soils during remediation will result in a substantial, but temporary, increase in disturbed areas. These areas will be regraded and revegetated, however, rendering the impacts temporary.

The continued restriction of the NTS to mining activities will result in the continued loss of some mineral resources and potential geothermal resources. The use of aggregate resources for construction will result in a cumulative impact to regional aggregate mining. However, aggregate resources are more than adequate to fill projected regional needs and the impact will not be significant.

Discontinuation of activities at the site would result in an increase in the areas of geological media and soils that are irretrievably lost as a resource.

6.4.5 Hydrology

Testing-related actions would add incrementally to the levels of subsurface contamination in

underground testing areas if any tests are conducted under or within 100 m (328 ft) of the water table.

Groundwater withdrawals on the NTS in excess of historic pumping levels, in conjunction with existing water withdrawals, will decrease the water available for future appropriation in the Death Valley flow system. The only action that would cause water withdrawals to exceed past levels would be the construction and operation of a Solar Enterprise Zone facility. The impacts of water withdrawals for a Solar Enterprise Zone facility are expected to be limited to a lowering of water levels at the NTS. No incremental impacts to downgradient water levels or water quality are anticipated. The withdrawal of water for a Solar Enterprise Zone facility in Clark County would add incrementally to the overall demand for water and would decrease the water available for future appropriation in the Colorado River flow system.

If a Solar Enterprise Zone facility is located in Eldorado Valley, water supplies would come largely from existing allocations and there would be minimal or no cumulative impact on groundwater availability. The Las Vegas Valley Water District once planned to import water from rural areas; however, if this plan proceeds, actual development will not occur within the 10-year planning period covered by the NTS EIS. An incremental demand for water in the Las Vegas basin may occur in response to population increases attributable to the proposed actions. However, such increases are not expected to be large.

6.4.6 Biological Resources

Cumulative impacts to desert tortoises would occur throughout the region, although the intensity of the impact would vary from location to location depending on the habitat. Impacts in the Las Vegas Valley could be substantial. The Clark County Desert Conservation Plan is authorized to take all tortoises on 110,000 acres of non-federal land in the county, and on 2,900 acres disturbed by Nevada Department of Transportation activities in Clark County and adjacent counties. Because the Las Vegas Valley does not have large "islands" of habitat capable of sustaining viable populations, the loss of habitat is not expected to jeopardize the continued existence of the Mojave population of the desert tortoise.

The Biological Opinion for the Yucca Mountain Site Characterization Project authorizes the incidental killing or injury of 15 tortoises, but only 4 have been killed along roads in the 6 years since the opinion was issued. The number killed is expected to decline further because surface disturbing activities have been largely completed.

The Draft Biological Opinion for the NTS (U.S. Fish and Wildlife Service, 1996) authorizes incidental take of: three desert tortoises injured or killed per year as a result of project activities; ten tortoises taken through capture and displacement from project sites; an unknown number taken through predation by ravens; an unknown number of tortoise eggs destroyed during construction activities; an unknown number taken indirectly in the form of harm or harassment through increased noise associated with operation of heavy equipment; and a total of 3,015 acres of desert tortoise habitat disturbed. No tortoises were killed due to project activities and only four have been killed along roads in the four years since an earlier opinion for the NTS was issued (U.S. Fish and Wildlife Service, 1992). Because similar rates of mortality are predicted for the future, the most important consideration would be that given to desert tortoise habitat. Under the Expanded Use Alternative approximately 15,600 acres of habitat would be disturbed. The areal extent of these disturbances within desert tortoise habitat won't be known until project sites are selected. Even if all of the disturbances were in tortoise habitat, which is unlikely, the loss would represent a small amount of available habitat, and negative effects on the tortoise population would be unlikely.

Because the NTS is surrounded by federal lands that are managed in part for wildlife, it is also unlikely that the small amount of habitat disturbed would negatively affect other biological resources.

Since historic groundwater withdrawals, including those from Yucca Flat at rates beyond the perennial yield, have not resulted in any detectable impacts on water table levels, no cumulative impacts on flora and fauna associated with Devils Hole or Ash Meadows are anticipated.

6.4.7 Air Quality

For the NTS, it is projected that construction activities under Alternative 3 would generate about 600 tons of fugitive dust (PM_{10}) per year. This level of construction-related grading activity will extend over a period of three years. This quantity of fugitive dust (PM_{10}) would comprise just over 3 percent of the total of 177,660 tons associated with land disturbance activities throughout the region represented by the Stateline and Tonopah resource areas and the Las Vegas Valley.

Of the air sheds within which NTS-related activities are located, only the Las Vegas Valley metropolitan area is classed as a non-attainment area for carbon monoxide. Quantities of other criteria pollutants associated with activities proposed under Alternative 3 would not generate a measurable increase in the Las Vegas metropolitan area. It is projected that quantities of carbon monoxide generated by mobile sources associated with NTS activities in Clark County would contribute 90 tons per year to the projected 47,532 tons per year identified in the Regional Transportation Plan of Clark County (Regional Transportation Commission, 1994). Such an increment represents less than 0.2 percent of the Clark County pollutant burden. This contribution would not produce any additional violations of the carbon monoxide ambient air quality standard. The Regional Transportation Commission of Clark County, Nevada, has determined that the Regional Transportation Plan conforms with the applicable State Implementation Plan for the National Ambient Air Quality Standards. Project-related mobile source emissions distributed throughout Nye County would not increase ambient pollutant concentrations above ambient standards.

6.4.8 Noise

At the regional level, it is expected that ambient noise levels will increase, especially in areas undergoing urban development and those that are adjacent to industrial and mineral extraction activities. Noise impacts associated with activities at the NTS will be restricted to the geographical area contained therein and would not affect persons resident in adjacent areas or add measurably to regional noise levels.

6.4.9 Visual Resources

The visual character of the region will change in selected areas especially in those undergoing urban development and near mineral extraction activities. In such areas, natural landscapes will be modified by human activities. In those areas undergoing development, it is anticipated that activities associated with the implementation of program alternatives will have only a minor effect on visual resources. In the case of a Solar Enterprise Zone facility, implementation would have more noticeable effects.

6.4.10 Cultural Resources

As a result of DOE activities, 40,492 acres on the NTS have been surveyed for cultural resources. The area surveyed represents approximately 4.7 percent of the land surface of the site. A site density of 0.043 sites per acre is estimated for the NTS. This estimate is based on the recording of 1,764 sites for DOE projects. This site density represents an average based on all of the sites recorded on the NTS. However, it must be recognized that site density can vary significantly with location.

General site densities for surrounding areas have been estimated by the U.S. Bureau of Land Management. Based on data for the Tonopah resource area, site density is estimated to be approximately 0.024 sites per acre. Also, according to the State Historic Preservation Officer's (SHPO) records, approximately 12 percent of all sites identified in Nevada are found to be eligible.

For non-NTS programs and projects, it is estimated that approximately 284,000 acres of land are likely to be disturbed over the next decade. About 80 percent of this disturbed acreage is located on federal lands and is associated with federal or state actions, with the remaining 20 percent attributable to development on privately held land. Using a site density value derived from the NTS, over 12,000 sites may be located within the disturbed area of the region. Approximately 1,460 of these sites may be eligible for inclusion in the National Register of Historic Places.

Impacts to cultural resources will occur through ground-disturbing activities, unauthorized artifact collecting, and vandalism. This may result in a loss of over 12,000 sites, 1,460 of which may be eligible for the National Register of Historic Places. Cultural resources associated with federal and state projects will be subject to Section 106 of the National Historic Preservation Act. For these cultural resources, identification, evaluation, and data recovery are likely to occur resulting in increases of cultural resources information to the regional database. Cultural resources on about 20 percent of the acreage disturbed (located on privately held land) may be destroyed without data recovery, resulting in a serious loss of the information value inherent in these nonrenewable resources.

For the combination of NTS and non-NTS programs and projects, it is estimated that between 284,000 and 300,000 acres are likely to be disturbed in the next 10 years. NTS programs and projects account for between 3.5 to 5.5 percent of the overall disturbed acreage. Using a site density value derived from the NTS, ground-disturbing activities at the NTS could result in the potential loss of an additional 670 sites under Alternative 3. Of these, about 80 may be eligible for the National Register of Historic Places. The addition of these NTS-related impacts to those attributable to all other activities could raise the number of potentially lost sites to between 12,200 and 12,900. Of these sites, between 1,460 and 1,550 could be eligible for the National Register of Historic Places.

6.4.11 Occupational and Public Health and Safety

Based on occupational injury and fatality rates for construction and other industrial activities, NTS actions would result in up to 775 injuries and 9 fatalities over the 10-year period evaluated in the NTS EIS. The NTS actions should not elevate regional rates, which should remain unchanged. Occupational radiation exposure to the worker population could be about 380 person-rem over the 10-year period, resulting in 0.128 latent cancer fatalities and about 1 in 17 of any other detrimental health effects in the worker population. Over the same period, the worker population would receive about 9,000 person-rem from naturally occurring cosmic radiation and radon, airplane travel, and personal medical procedures (X-rays, radiodiagnostics).

The remote location of the NTS insulates the general public from NTS activities. Potential impacts to the public from routine airborne emissions of radioactivity and priority pollutants would be minimal. Over the same period, the population in the Las Vegas Metropolitan planning area would receive a radiation dose of about 3.0×10^6 person-rem from naturally occurring cosmic radiation and radon, airplane travel, and personal medical procedures (X-rays, radiodiagnostics). No impacts to the public from exposure to groundwater containing radioactivity from past activities would be expected during the 10-year period evaluated in the NTS EIS.

6.4.12 Environmental Justice

American Indian Environmental Justice concerns, as identified by the Consolidated Group of Tribes and Organizations, include holy land violations, perceived risks from radiation, and cultural survival. Increased land disturbance associated with all forms of development in the region of influence could result in a decrease in access to these areas for American Indians. Limiting access could reduce the traditional use of the area and affect its sacred nature. Increased development throughout the region of influence has the potential for greater disturbance and vandalism of American Indian cultural resources. Such impacts would be perceived, in the main, by American Indian groups who would comprise the population group experiencing disproportionate impacts as a result of project implementation.

6.5 Summary of Cumulative Impacts

A summary of cumulative impacts described on a resource-specific basis is presented in Table 6-5.

Table 6-5. Summary of cumulative impacts (Page 1 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Land Use	Over the period 1996-2005, it is likely that changes in ownership involving the disposal of public lands in the Las Vegas area will continue. As the Las Vegas metropolitan area continues to expand, land-use development and zoning regulations will extend over a larger geographical area. Where land-use zoning regulations are absent, as in Nye County, incompatible land use patterns may evolve. The number of civilian aircraft operations in the region will increase as the levels of population and economic activity grow. Military aircraft operations associated with activities at Nellis Air Force Base and the NAFR Complex are expected to increase gradually over the next decade.	Activities at the NTS under all alternatives are not expected to effect land-use patterns or land ownership in measurable ways. The majority of DOE and DoD aircraft transiting to and from the NTS/NAFR Complex use existing corridors that are adequate to accommodate future use. These corridors do not conflict with routes flown by commercial aircraft.	Activities at the NTS are expected to have negligible effects on regional land-use patterns and land ownership. Activities at the NTS would have negligible effects on regional airspace and its use.
Transportation	Rapid urban development will continue to place pressure on existing transportation infrastructure. Level of service on key roads within the metropolitan Las Vegas region and on segments of I-15, U.S. Hwy 95, and U.S. Hwy 93 could deteriorate to unacceptable levels by the year 2000. Approximately 4.0×10^6 vehicle trips per day are projected for Clark County in the year 2005. Planned highway improvements over the next two decades are expected to meet the increased vehicle use. Impacts of transportation of radioactive materials consist of impacts from (1) historical shipments of radioactive waste and spent nuclear fuel to the NTS, (2) other historical shipments, (3) contributions made by the alternatives evaluated in the NTS EIS, (4) reasonably foreseeable actions that include transportation of radioactive material, and (5) transportation of general radioactive materials that are not related to a particular action.	Virtually all impacts to transportation would occur on site under all project alternatives. Maximum off-site impacts would occur under Alternative 3 as additional workers at the NTS commute over regional highways. Such impacts are expected to be negligible. In the year 2005, NTS-related activities would add approximately 1,030 one-way vehicle trips per day to approximately 4.0×10^6 occurring daily in Clark County. Trucks bringing radioactive wastes to NTS would increase from 2 under Alternative 1 to 11 under Alternative 3. The total number of waste shipments from off-site generators could reach 40,000 under Alternative 3. The collective general population dose (person-rem) could reach 154.0.	Impacts to regional transportation facilities associated with NTS activities will comprise a negligible increment. The estimated number of transportation-related latent cancer fatalities attributable to NTS Alternative 3 would be indistinguishable from other latent cancer fatalities. They would comprise 0.0008 percent of the total number of latent cancer fatalities.
Socioeconomics	Population in Clark County is projected to increase to approximately 1.2×10^6 persons by the year 2000 and 1.4×10^6 by the year 2005. This rapid growth could result in substantial increases in demand for housing, schools, and other public services. Additional expenses associated with construction of new facilities and personnel could produce adverse conditions in the area of public finances for local jurisdictions and service providers.	NTS related activities under Alternative 3 would add only 10,000 persons to a projected population of approximately 1.4 million in Clark County in the year 2005. This minor (less than 1-percent) increase would not result in adverse socioeconomic impacts. Under Alternative 2, some out-migration of NTS workers and their families from the region could occur. Impacts would be negligible.	In- and out-migration potentially associated with Alternatives 3 and 2, respectively, would contribute only negligible impacts to regional socioeconomic effects.

Table 6-5. Summary of cumulative impacts (Page 2 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Geology and Soils	Geological resources include sand and gravel, mineral products, petroleum and natural gas, and geothermal resources. Continued urban development will influence the demand for sand and gravel with the demand for other resources related more to national and international market forces.	Types of activities at the NTS relate to subsurface contamination through underground testing. Restrictions placed on public access to the site adversely impact the use of mineral and geothermal resources.	It is not anticipated that continued inaccessibility of mineral and geothermal resources at the NTS will result in measurable adverse impacts. These resources are widespread in their occurrence and exist in adequate quantities to fulfill anticipated regional needs.
Hydrology	Rapid urban development in the Las Vegas area and southern Nye County has contributed to a state of groundwater overdraft. This condition is likely to be exacerbated as water made available through allocation from the Colorado River is committed.	Groundwater withdrawals on the NTS in excess of historic pumping levels will decrease the water available for future appropriation in the Death Valley flow system. Such increases in withdrawals would be associated with the location of the Solar Enterprise Zone on the NTS. The location of this proposed facility could lower water table levels on the NTS.	Any additional demand for water derived from groundwater sources could exacerbate an existing overdraft condition. Although the development of the Solar Enterprise Zone has the possibility of lowering the water table on the site (or at other potential locations offsite), water withdrawals associated with its operation are not expected to affect downgradient water levels or water quality.
Biological Resources	Development and implementation of the Desert Tortoise Recovery Plan is designed to ensure the sustainability of the species. It is unlikely, however, that the species will survive in large sections of the Las Vegas Valley. The Clark County Desert Conservation Plan authorizes the "take" of all tortoises on 110,000 acres of non-federal land in the county. The Plan designates several recovery units located in areas of prime desert tortoise habitat that are subject to a number of land-use constraints designed to optimize the survival and recovery of the species in these units.	The potential exists for disturbance to as much as 15,600 acres of land at the NTS under Alternative 3. Such a loss represents a small amount of the available habitat, and adverse effects to the desert tortoise are not anticipated.	Activities at the NTS will not add measurably to the loss of desert tortoise habitat.

Table 6-5. Summary of cumulative impacts (Page 3 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Air Quality	The Las Vegas metropolitan area is a nonattainment area for PM_{10} and carbon monoxide (CO). It is anticipated that continued rapid urban development will exacerbate these conditions. The Regional Transportation Commission of Clark County has prepared a Regional Transportation Plan which would allow the county to be in conformity with the State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Nye County is in attainment for all criteria pollutants.	Much of the local impact under Alternative 3 is associated with ground disturbance and the generation of fugitive dust (PM_{10}). The NTS is located in Nye County and, although activities would increase quantities of dust, it is not expected that State and national ambient air quality standards would be exceeded. Only a small portion of the pollutants associated with mobile sources would occur in Clark County. Although this would add approximately 90 tons per year of carbon monoxide (CO) to the projected CO emissions of 47,532 tons per year in Clark County by the year 2000, it would not create additional violations of the CO ambient air quality standard. Marginal improvements in air quality standards could be expected under Alternative 2.	With implementation of the Regional Transportation Plan in Clark County, it is expected that conformity with the State Implementation Plan for all National Ambient Air Quality Standards will be achieved. Effects associated with NTS activities are not expected to hinder this achievement of conformity. It is not expected that ambient air quality standards in Nye County would be exceeded in the near future.
Noise	In areas undergoing urban development, ambient noise levels can be expected to increase. In areas lacking land-use controls to guide development, incompatible land uses could occur.	Noise impacts associated with activities at the NTS have the potential to affect only an extremely small number of persons because of constraints that exist for access to the site by the general public.	Activities associated with implementation of Alternative 3 would not add measurably to regional noise levels.
Visual Resources	The visual character of areas would change as urban development and mineral extraction activities continue.	No significant changes are expected to occur to existing facilities at the NTS under Alternatives 1, 3, and 4. Under Alternative 2, deterioration of facilities could occur that would marginally degrade the visual environment.	Facilities at the NTS are not accessible to the general public, and impacts would have a negligible impact on regional visual resources.
Cultural Resources	As a result of ground-disturbing activities and unauthorized artifact collecting, over 12,000 sites, 12 percent of which (1,460) may be eligible for the National Register of Historic Places, will be adversely affected. Cultural resources found on private lands may be destroyed without data recovery, resulting in a serious loss of the information value inherent in these nonrenewable resources.	Ground-disturbing activities at the NTS could result in the potential loss of an additional 670 sites under Alternative 3. Of these, about 80 may be eligible for the National Register of Historic Places.	The addition of these NTS-related impacts to those attributable to all other activities could raise the number of potentially lost sites to between 12,200 and 12,900. Of these sites, between 1,460 and 1,550 could be eligible for the National Register of Historic Places.

Table 6-5. Summary of cumulative impacts (Page 4 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Occupational and Public Health and Safety	With the number of persons residing and working in the region, the number of injuries and fatalities will increase. However, injury and mortality rates should remain unchanged, or decrease, assuming the continued enforcement of occupational and public health and safety regulations.	Activities at the NTS could result in up to 775 injuries and 9 fatalities over the period 1996-2005. Occupational radiation exposure to the worker population at the NTS could be 380 person-rem, resulting in 0.128 latent cancer fatalities and 0.096 other detrimental health effects in the worker population.	Activities at the NTS contribute extremely small increments to the risks to which the general population is exposed on a daily basis and should not increase injury and mortality rates in the region.
Environmental Justice	The non-NTS programs and projects account for approximately 284,000 acres of land disturbance. Land disturbance of this size could have adverse impacts on Americans Indians who have expressed concerns about holy land violations and the continued survival of their culture.	Concerns that representatives of American Indian groups have expressed relative to activities at the NTS include holy land violations, perceived risks from radiation, and the continued survival of their culture. Land disturbance at the site could have adverse impacts in these areas of concern.	Land disturbance in the region, attributable to changes in use away from an undeveloped state, could potentially raise environmental justice concerns. The increment to such land disturbance contributed by proposed actions at the NTS would be minimal and would not add measurably to the level of concern.

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Chapter 7

MITIGATION MEASURES

CHAPTER 7
MITIGATION MEASURES

This section presents the mitigation measures that would be implemented by the DOE to reduce potentially adverse impacts to the environment. The four alternatives analyzed in this EIS represent a wide range of projects and activities that have associated with them a corresponding range of potentially adverse environmental impacts. There are, therefore, a range of mitigation measures that would be implemented and that are designed to ameliorate the potentially adverse impacts associated with specific activities. The mitigation measures presented in this chapter comprise a series of actions which address the full range of potential impacts likely to occur under the identified alternatives. They are summarized below by resource category. Where impacts and mitigation measures vary across alternatives, measures specific to each alternative are described. Under Alternative 2, closure of the NTS would include the development and implementation of monitoring programs necessary to protect human health and the natural environment. Under all alternatives, DOE will continue to maintain the Waste Minimization/Pollution Prevention Program as described in Appendix C, Section 6.

Throughout the history of the NTS, the DOE, the State of Nevada, Nye, Esmeralda, Clark, and Lincoln counties, and local communities have contributed to the success of the NTS. As Nye County encompasses most of the NTS land area, DOE has worked closely with Nye County as activities have changed over the years. In accordance with 10 CFR Part 1021.331 and in the interest of continuing this relationship with the state, counties, and communities, the DOE will prepare a Mitigation Action Plan. This document will describe the actions to implement commitments made in this EIS and its associated Record of Decision (ROD) to mitigate adverse environmental impacts associated with the alternative adopted through the ROD. The Mitigation Action Plan will be as complete as possible commensurate with information available regarding the course of action directed by the ROD. The DOE may revise the plan as more specific and detailed information becomes available.

7.1 Land Use

Impacts to land use in areas surrounding the NTS under Alternatives 1, 2, and 3, and at the off-site locations under Alternatives 1 and 2 would be minimal and require no mitigation. Under Alternative 4, there is a possibility that a portion of currently withdrawn lands would be relinquished to the U.S. Bureau of Land Management. Should this land be found suitable for return to the public domain, the U.S. Bureau of Land Management would determine the ultimate land management and use policies. The land-use impact under this scenario would be an increase in lands available for use by the public, and mitigation measures appropriate to the use designation would be developed and implemented by the U.S. Bureau of Land Management.

Land-use impacts on the NTS under Alternative 1, the continuation of current activities, and Alternative 3, expanded use, would be generally consistent with existing site and zone designations. Although certain activities would intensify and others would expand under Alternative 3, additional mitigation measures beyond those presently employed would not be required. Under Alternative 2, all activities would cease at the NTS and no new activities would be allowed. Access to, and use of, the lands would be restricted. Minimal monitoring and security operations would continue, and no mitigation would be required under this non-use scenario.

Activities that would occur outside the NTS boundaries under Alternatives 3 and 4, e.g., Solar Enterprise Zone facility development, have the potential to result in land-use impacts. Projects that are located on federal land or are funded by agencies of the U.S. Government will be subject to additional review under provisions of the National Environmental Policy Act. This review will require

the identification of significant environmental impacts, including land-use impacts, and the formulation of measures to mitigate these impacts to the extent practicable.

No adverse impacts to airspace are identified requiring mitigation under any of the alternatives at any project location.

7.2 Transportation

The following sections contain the discussion on the mitigation measures for transportation.

7.2.1 On-Site Traffic

It is anticipated that no on-site roadway segments would degrade to unacceptable levels of service under any of the alternatives at any project site; therefore, no mitigation measures would be required.

7.2.2 Off-Site Traffic

Should Alternatives 1, 2, or 4 be implemented, no substantial adverse impacts to traffic conditions are expected near the NTS at the access highway State Route 433, the ramp roadways at the Mercury Highway interchange, at U.S. Highway 95, or at any other project site; therefore, no mitigation measures, other than the continuing busing program, would be necessary.

Under Alternative 3, the highway that accesses the NTS (State Route 433) would drop to a level of service D (acceptable) between the years 2000 and 2005. The NTS-related traffic contributes minimally to the Las Vegas area traffic demands. Similarly, no mitigation measures would be necessary for roadways in the immediate vicinity of the NTS.

Ongoing and future development in the Las Vegas metropolitan area would result in an increase in traffic volumes and congestion on key roadway segments (namely, on Interstate 15, U.S. Highway 95, and U.S. Highway 93). These key segments already operate at an unacceptable level of service F at peak hours, and their conditions could continue to deteriorate even without the activities associated with all alternatives. Currently, roadway improvements are being undertaken along Interstate 15 in downtown Las Vegas and at other locations. With the improvements planned under the Regional Transportation Plan of Clark County, the highway conditions are expected to improve. No additional mitigation measures are needed.

7.2.3 Transportation of Materials and Waste

Under Alternatives 1, 3, and 4, the routes used for truck shipments would be chosen using U.S. Department of Transportation routing guidelines. These guidelines are designed to reduce the radiological risks associated with transportation. According to the guidelines, primary factors include (1) the radiation exposure from incident-free transport, (2) the risk to public health from an accidental release of radioactive material, and (3) the economic risk from an accidental release of radioactive material. Secondary factors, according to the guidelines, include (1) emergency response effectiveness, (2) evacuation capability, (3) location of special facilities such as schools or hospitals, and (4) traffic fatalities and injuries unrelated to the radioactive nature of the cargo.

The EPA has developed protective action guides and protective actions that are designed to limit doses in the event of a nuclear incident. Use of these guides and actions under Alternatives 1, 3, and 4 will minimize the impacts of transportation accidents involving radioactive material. In addition, the DOE will take the following actions:

- Conduct full government-to-government consultation with American Indian tribes that would be affected by the transportation of low-level waste and low-level mixed waste to the NTS
- Conduct a comprehensive study of the potential social and cultural effects of low-level waste and low-level mixed waste transportation on affected American Indian tribes
- Meet with the Transportation Protocol Working Group regularly to discuss low-level

waste and low-level mixed waste transportation issues

- Respond to transportation concerns between meetings by phone calls, faxes, or personal meetings
- Continue to provide First Response and other emergency response training to all Nevada emergency response personnel
- Allow low-level waste and mixed waste shipments arriving at the NTS during off-hours to park in a secure area inside the gate
- Work with local emergency response agencies to determine their needs with regard to responding to emergencies involving low-level waste and low-level mixed waste and to help fulfill those needs as far as practicable
- Provide information to stakeholders concerning waste shipments
- Distribute surplus federal equipment to local agencies to the extent possible under current regulations concerning federal surplus disposition.

7.2.4 Other Transportation

All other transportation modes will follow guidelines established by the Department of Transportation, the Federal Aviation Administration, and all federal, state, and local laws and regulations under each alternative.

7.3 Socioeconomics

No long-term adverse impacts are associated with implementation of any alternative over the 10-year period of this EIS for any socioeconomic issue: economic activity, population, housing, public finance, or public service. The loss of employment and personal income and the increase in unemployment associated with Alternative 2 would result in substantial short-term adverse effects to the regional economy; however, economic and natural growth in the region of influence is expected to compensate for these reductions over time. Reductions in employment at the NTS relative to historical NTS employment levels are also inherent in Alternatives 1 and 4. While no long-term mitigation measures are required, the following supportive measures could be undertaken to the level appropriate for the alternative selected:

- Continue to extend economic adjustment efforts to reduce the impact of NTS downsizing on workers and small and medium sized companies. The DOE economic adjustment efforts could include actions such as enhanced coordination of DOE downsizing actions and employee assistance programs with public agencies and small and medium-sized companies who are current suppliers of goods and services (Alternatives 1, 2, and 4)
- Sponsor a joint local, state, and federal conference to promote a national and international environmental technology development center (Alternative 4)
- Act as a catalyst to develop joint proposals for research activities (Alternatives 1, 3, and 4).

American Indian Socioeconomics—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CGTO.

When Indian people are hired, special problems emerge for themselves, families and reservation communities. The DOE can assist in mitigating these problems by recognizing the exact nature of the problems and developing a culturally responsible approach to mitigating the problem. For example, an Indian employee may be required to attend a ceremony back on the reservation. When this situation occurs, the DOE could grant special leave status to the employee to participate in the ceremony. The children of the Indian employee may go to non-Indian schools causing cross-cultural stresses. The DOE could potentially mitigate this situation by developing an American Indian outreach/educational program directed at the school system and the surrounding communities. Cultural awareness activities could be implemented similar to the Yucca Mountain Project's outreach program which incorporates knowledgeable Indian people who share various

aspects of their culture. The DOE could encourage other Indian employees to participate in the development and implementation of these culturally specific programs.

Reservation problems resulting from the loss of tribal members to external employment with the DOE/NV, cannot be fully identified without a systematic study of these issues involving the tribes. It is recommended that this issue be mitigated by the DOE/NV, and be specifically addressed by the DOE/NV Diversity Council. The CGTO potentially can serve as a management consultant to the DOE for the development and implementation of culturally specific programs which address the unique issues that may arise due to off-reservation migration caused by the employment of Indian people.

7.4 Geology and Soils

Impacts to geologic media by activities under Alternatives 1 and 3 can be generally categorized as disturbance, contamination, excavation, or instability. The magnitude of these impacts largely depends on the nature of the activities resulting in these impacts.

Disturbance to surface and subsurface geologic media and radioactive contamination of subsurface geologic media resulting from testing of conventional or nuclear weapons are inherent with the tests. Surface disturbance and the dispersion of contamination are mitigated by implementing containment practices. Containment practices also mitigate radioactive contamination of surface geologic media.

- Contamination of surface and subsurface geologic media from release of radionuclides from disposed waste is mitigated by administrative and physical controls. Siting, design, operation, and monitoring of waste management facilities on the NTS and NAFR Complex are conducted in accordance with relevant regulations. Physical controls include the various disposal and closure configurations. Contamination of surface and subsurface geologic media resulting from accidental spills is also mitigated by administrative and physical controls. Administrative controls include occurrence reporting, emergency response plans, and training. Physical controls include secondary containment and response equipment

- Excavation includes boreholes and tunnels for testing of conventional and nuclear weapons, grading for roads and facilities, borrow pits, boreholes and trenches for waste disposal, and grading for environmental restoration. Excavation for other purposes is mitigated by minimizing the area disturbed

- Surface disturbances will be mitigated on a site-specific basis, depending on various factors such as the size of the area, future use, nature of soils, annual precipitation, slope aspect, and site location. Following the removal of soils and vegetation, the site will be immediately stabilized using water or commercial-available soil stabilizers, such as polymers. Options to be considered for mitigation include natural revegetation, gravel rearmoring, chemical stabilization, seeding, planting, and irrigating. Where intensive revegetation techniques are necessary, subsoils may be amended and irrigations may be used. At drier sites, irrigation could be used to encourage germination and plant establishment. Instability of slopes resulting from excavation is mitigated as necessary to protect the environment or to ensure employee health and safety. The mitigation measures include administrative controls and physical controls such as shoring, bolting, and grouting.

Adverse impacts that would result from nuclear testing under Alternatives 1 and 3, should testing be resumed, would be unavoidable and could not be mitigated. Adverse impacts that would result from underground subcritical experiments using special nuclear material would be unavoidable and could not be mitigated.

No adverse impacts to geological resources are anticipated under Alternatives 2 and 4, and no mitigation measures are suggested.

7.5 Hydrology

Discussions of mitigation actions for surface hydrology and groundwater are presented in the following sections.

7.5.1 Surface Hydrology

Impacts to the surface hydrologic environment by activities under Alternatives 1 and 3 can be categorized generally as alteration of natural drainage, which potentially results in erosion or deposition of sediments, ponding of water, or inundation, and contamination. The extent of these impacts largely depends on the nature of the activities resulting in these impacts. Surface water quality impacts may result from the Environmental Restoration Program cleanup of plutonium-contaminated soils.

- The effects of altering natural drainage are mitigated by preactivity analysis of the flood potential and recommendations for minimizing direct and indirect flood hazards, followed by implementation of the recommendations. Typically, recommendations for minimizing direct and indirect flood hazards include construction of flood diversion structures

- Contamination may be mitigated by avoidance of surface water or groundwater contamination through lined storage/settlement ponds and environmental restoration of the affected area. Restoration typically might be excavation of contaminated geologic media, followed by grading and stabilization by revegetation

- With regard to the remediation of soils contaminated with plutonium, surface water controls will be implemented as part of the cleanup effort. However, there could be some breaching of control features resulting in the migration of contamination into downgradient areas. Such releases can be mitigated by expanding the soils media corrective action unit to include the area of release. The impacts would then be mitigated through the excavation of contaminated soils, removal of the plutonium, and return of the treated soils.

No adverse impacts to surface hydrology are anticipated under Alternatives 2 and 4, and no mitigation measures are proposed.

7.5.2 Groundwater

Potential adverse impacts on groundwater availability may be anticipated as a result of Alternatives 1, 3, and 4 actions. Large-scale groundwater withdrawals may be implemented to ensure there are no releases beyond the controlled NTS and NAFR Complex areas and other potentially affected areas via the flow of groundwater during Environmental Restoration Program activities. Any significant impacts on groundwater quality would be related to the underground testing program.

- Mitigation of groundwater availability impacts may be achieved through adjustments in the overall production of water from the well field and the drilling of new water supply wells, as required, and through the management of recharge and discharge areas in conjunction with the remedial action

- Under the Environmental Restoration Program, large-scale groundwater withdrawals may be implemented to ensure that no releases beyond the boundary of the site occur via the flow of groundwater. The potentially adverse impacts of such actions could be mitigated through the careful management of recharge and discharge areas in conjunction with the remedial action. These activities would occur as part of the underground test area corrective action unit.

The quantity and quality of groundwater resources could be substantially impacted under Alternative 3 if any of the following circumstances occur: (1) underground tests are conducted under or near the water table; (2) a Solar Enterprise Zone facility is located on the NTS; or (3) active groundwater controls are implemented under the Environmental Restoration Program.

Mitigation of the quantity of water available for appropriation in the affected basins surrounding a constructed Solar Enterprise Zone facility would not

be required because the use of the water would be consistent with Nevada water laws. Although water use from Solar Enterprise Zone facility activities would be consistent with Nevada water laws, the private corporation implementing the technology would bear the responsibility of mitigating any adverse effects. The impacts of any water level declines can be mitigated through a number of potential actions: proper well field design and placement, moving the points of diversion farther away from potentially affected areas, optimizing water use, or importing water from adjacent areas.

7.6 Biology

The *Framework for the Resource Management Plan*, Volume 2 of this document, defines the ecosystem management principles which would be used to mitigate impacts related to biological resources:

- All reasonable and prudent measures required by the U.S. Fish and Wildlife Service to mitigate incidental taking of endangered or threatened species will be implemented
- Habitat disturbance may be partially mitigated by implementing a habitat reclamation program
- The DOE will conduct preactivity surveys to locate protected species such as candidates for listing under the Endangered Species Act, state-protected species, nests and eggs of migratory birds, individuals of a species that are locally rare (e.g. an isolated stand of Joshua trees on a bajada), references upon which these species may depend (e.g. free-standing water, burrows, nests), and other important biological resources such as Species of Concern. Project activities will be altered whenever possible to avoid harm.
- Migratory birds or other wildlife may drown or be exposed to drill-mud additives or could ingest chemicals in drill-fluid sumps, or evaporative tanks. These problems may be mitigated by placing flag lines that repel wildlife over the water sources, or by fencing or covering them.
- Impacts arising from military training exercises and other land-disturbing activities that have not yet been sited can be partially mitigated by developing and implementing a Resource Management Plan, which would be based on the principles of ecosystem management; identify sensitive areas, such as springs or habitats of rare species; and regulate harmful activities in those areas. This plan also would guide the collection of additional information needed to protect biological resources and the health and the ecosystem on the NTS. Volume 2 describes the DOE's framework for developing this *Resource Management Plan*.

Under Alternative 2, the following mitigation measure will be implemented:

- All reasonable and prudent measures required by the U.S. Fish and Wildlife Service to mitigate incidental taking of endangered or threatened species will be implemented.

7.7 Air Quality

Air quality mitigation measures under Alternatives 1, 3 and 4 at the NTS include the following:

- Continue the use of a central parking facility to transport workers to and from construction sites. Pooling the transportation of workers to remote sites from central parking localities would lower dust and carbon monoxide levels because fewer vehicle trips would be involved.
- Properly maintain construction vehicle engines requiring air pollution control equipment. Properly tuned equipment would emit fewer harmful pollutants. This measure is highly effective in minimizing local air degradation.
- Place speed restrictions for vehicles on unpaved roads. Dust levels generated by moving vehicles on unpaved roads are substantially reduced at low speeds. Imposing appropriate speed limits on these roads could effectively reduce fugitive dust.

- Continue to control fugitive dust by regularly watering the construction areas, as needed, thereby achieving a 50-percent reduction in emissions. This measure would be included in future construction contract specifications to minimize construction-phase emissions.

No air quality mitigation measures are required under Alternative 2 because there would be no adverse impacts.

7.8 Noise

No mitigation measures under any of the alternatives would be required at any of the project locations. However, should site activities exceed Occupational Safety and Health Administration noise level requirements, mandatory hearing protection for people working in the areas would be implemented.

7.9 Visual Resources

There would be no significant adverse impacts to visual resources under any of the alternatives. However, under those alternatives involving environmental restoration activities, areas would be revegetated with indigenous plants to return the sites to as natural an appearance as possible and to prevent excessive erosion and dust that could result in more serious, long-term adverse impacts. This measure would apply to all the project sites. Construction areas would be watered, as needed, to reduce dust.

7.10 Cultural Resources

Sites potentially eligible for listing in the National Register of Historic Places have been identified in numerous areas within which development associated with activities proposed under Alternatives 1, 3, and 4 may take place. Some of the prehistoric sites have the potential to provide information that will contribute to the understanding of hunter-gatherer settlement and subsistence patterns typical of the central Great Basin, while sites dating to the later historic period can contribute to a clearer understanding of the nuclear era (Cold War Era). Sites also have been identified on the NTS that are important to the economic or religious practices of American Indian people.

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that federal agencies take into account the effects undertakings may have on historic properties (i.e., sites eligible for the National Register of Historic Places). The most effective mitigation measure is avoidance; however, avoidance is not always possible. Mitigation of adverse impacts to cultural resources would be handled on a case-by-case basis through consultation with the State Historic Preservation Office (SHPO) and through a programmatic agreement initiated by the SHPO and the DOE.

Any archaeological sites eligible for the National Register of Historic Places that cannot be avoided would be mitigated through the implementation of a data recovery plan formulated to address research goals important to an understanding of Nevada prehistory and history (Lyneis, 1982). Data recovery for prehistoric and historic archaeological sites may include, but not be limited to archival research, surface collection, photodocumentation, site evacuation, feature and artifact analyses, and specialized analysis such as radiocarbon dating, and obsidian sourcing and hydration.

Any historic or Cold War Era architectural sites eligible for the National Register of Historic Places that cannot be avoided would be mitigated through the implementation of data recovery plans formulated to address research goals important to understanding Nevada history and Cold War Era technology. Data recovery for historic and Cold War Era architectural sites may include, but not be limited to, archival research, photodocumentation, architectural recordation including the study of as-built plans, and implementing Historic American Building Survey/Historic American Engineering Record documentation standards. All mitigation measures for cultural resources including data recovery would be conducted within established health and safety guidelines.

Data recovery for prehistoric and historic archaeological sites may include, but not be limited to archival research, surface collection, photodocumentation, site excavation, feature and

artifact analyses, and specialized analyses such as radiocarbon dating, and obsidian sourcing and hydration.

The CGTO recommends that mitigation programs implemented at the NTS fully incorporate the assistance of American Indian people so that adverse impacts on American Indian resources can be efficiently averted. American Indian people know the NTS landscape in great depth and thus can help scientists with the identification of plants, animals, geography, archaeological sites, and traditional cultural properties that have been or will be adversely impacted by NTS programs and activities.

The CGTO considers that the natural and spiritual balance of the NTS landscape has been profoundly upset by prolonged nuclear testing activities and that the land must be purified and the spirits appeased in order to fully restore the environment to its previous condition. Through ceremonies, prayers, and offerings, American Indian people will contribute to increase the benefits of mitigation and will aid in restoring the spiritual harmony of impacted landscapes.

There are a number of proposed NTS actions that are of great concern to Indian people because of their adverse impact on the American Indian landscape. To avert or mitigate such impacts, the CGTO recommends that the DOE/NV fund systematic American Indian studies to:

- *Identify those areas/resources that are irreparably damaged, as well as areas/resources that can be restored for human use*
- *Avoid further ground-disturbing activities*
- *Make mitigation of restorable areas a top priority*
- *Replace lost plant and animal species*
- *Avert or minimize damage to geological formations*
- *Implement environmental restoration techniques that require minimum ground-disturbing activities*
- *Develop systematic consultation with American Indians so that potentially impacted resources can be identified, alternative solutions discussed, and adverse impacts averted*
- *Give American Indian people access to adversely impacted areas so that they can contribute their knowledge, purification ceremonies, prayers, and offerings to the restoration of the natural and spiritual harmony of the NTS landscape.*

In addition to these recommendations that derive from analysis of potential action and alternative impacts to American Indian cultural resources, the CGTO made the following stipulations and recommendations at the first CGTO meeting with the DOE NTS EIS study team:

- *Consultation with the CGTO does not relieve the DOE/NV of its obligation to maintain a government-to-government relationship with American Indian tribes*
- *The DOE/NV must consult with all culturally affiliated tribes and organizations belonging to the CGTO*
- *The DOE/NV should incorporate other American Indian tribes and organizations when considering activities away from (i.e., outside the American Indian region of influence) the NTS*
- *The CGTO recommends that the DOE/NV incorporate wherever possible in the NTS EIS the "Final Tribal Recommendations to DOE" prepared at the second mitigation meeting, Nevada Test Site American Indian Religious Freedom Act, October 1-3, 1993*
- *The CGTO recommends that DOE/NV incorporate wherever possible in the NTS EIS all former American Indian recommendations made by the CGTO to the DOE*

- *The CGTO recommends the continuance and expansion of the American Indian consultation program*

- *The CGTO recommends that they be actively involved in the planning, developing, and monitoring of all future DOE/NV ground-disturbing activities*

- *Public meetings are not the proper way to consult with tribes and organizations. They should not be considered "stakeholders" as defined by the DOE.*

- *Responses to the various NTS EIS alternatives:*

  Alternative 1, (No Action, Continue Current Operations). The CGTO opposes Alternative 1 because of our strong cultural ties to the land.

  Alternative 2, (Discontinue Operations). The CGTO supports Alternative 2 with the inclusion of access and protection of all cultural resource sites.

  Alternative 3, (Expanded Use). The CGTO opposes Alternative 3 because of our strong cultural ties to the land.

  - *The CGTO recommends that lands set aside for exclusive Indian use continue to be kept free, secure, and monitored for contamination of radioactivity and hazardous waste.*

  - *The CGTO recommends that the Gold Meadow area be set aside for exclusive Indian use because the area contains a concentration of important cultural resources.*

  Alternative 4, (Alternate Use of Withdrawn Lands). The CGTO tentatively supports Alternative 4 with reservations regarding certain components of this alternative.

The following statements are specifically adapted from the first CGTO meeting by the AIWS to reflect new information compiled during the work of the AIWS. The recommendation of mitigation by the AIWS does not imply they support the alterative; it merely is the best way of responding to impacts on American Indian cultural resources.

If Alternative 1 is chosen, the following measures are recommended for DOE implementation: continue the American Indian Religious Freedom Act Compliance Program, expand American Indian ethnographic studies, provide access to the CGTO to culturally sensitive areas to conduct land restoration ceremonies, limit non-Native personnel access to culturally sensitive areas, continue to give access to American Indian monitors needed for cultural resources investigations, and provide for American Indian monitors needed for oversight of land and DOE activities.

If Alternative 2 is chosen, the following measures are recommended for DOE implementation: continue the American Indian Religious Freedom Act Compliance Program, turn back the land to the CGTO, provide for American Indian Monitors needed for oversight of the land and DOE activities, and provide access to the CGTO to conduct land restoration ceremonies.

If Alternative 3 is chosen, the measures recommended for this Alternative are the same as for Alternative 1.

If Alternative 4 is chosen, the following measures are recommended for DOE implementation: continue the American Indian Religious Freedom Act Compliance Program, limit non-Native personnel access to culturally sensitive areas, and designate joint-use areas for three ethnic groups.

Subject to funding, scheduling, and the requirements of existing agreements with state, federal, and local agencies, the DOE will continue to consult on a government-to-government basis and will evaluate study proposals to fund those studies which would:

- Identify those areas and resources that are irreparably damaged, as well as areas and resources that can be restored for human use

- To the extent practicable, avoid further ground disturbing activities
- Make mitigation of restorable areas a top priority
- Replace lost plant and animal species
- Avoid or minimize damage to geological formations
- Implement environment restoration techniques that require minimum ground disturbance.

Several of these study topics are consistent with the DOE/NV past and present restoration policies and would dovetail with remediation plans. The DOE will continue to coordinate with the Consolidated Group of Tribes and Organizations to develop formal consultation procedures as proposed in Appendix G, and will consider the steps for participation proposed by the American Indian Writers Subgroup in Volume 2, *Framework for a Resource Management Plan*. After approval and acceptance of such procedures, systematic consultation and coordination with American Indian tribes will be planned so that potentially impacted resources can be identified, alternative solutions discussed, and adverse impacts mitigated where possible.

For purposes of the contribution of knowledge, purification ceremonies, prayers, and offerings for the restoration of the natural and spiritual harmony of the NTS landscape, the DOE/NV will strive to give the American Indian people access to adversely impacted areas. Such access will be subject to reasonable times, health and safety restrictions, security requirements, and the agreement of the managing agency where sites are not on DOE-controlled lands. Reasonable efforts will be made to accommodate Indian people.

For sites not under their control, the DOE will consult and coordinate with tribes having cultural ties to sites in question, on a government-to-government basis. Through the consultation and coordination processes committed to heretofore, the Consolidated Group of Tribes and Organizations or other appropriate tribal organizations would be actively involved in the planning, developing, and monitoring of future ground disturbing activities. Such involvement would be subject to restrictions imposed by funding, scheduling, security, and agreements with the state of Nevada and federal agencies.

The DOE/NV acknowledges that consultation does not relieve the DOE/NV of its obligation to maintain a government-to-government relationship with American Indian tribes. The DOE will, to the extent practicable, incorporate wherever possible all previous Consolidated Group of Tribes and Organizations' recommendations. The DOE/NV acknowledges further that public meetings are not the appropriate way to consult with the Indian tribes and organizations, and does not consider the tribes and organizations to be "stakeholders."

7.11 Occupational and Public Health and Safety

The areas of concern are risks associated with occupational injuries and fatalities, traffic accidents resulting in injuries and fatalities, and exposures to ionizing radiation.

Implementation of activities proposed under Alternatives 1, 3, and 4 would not result in significant adverse impacts to the general public. Additionally, risks to which workers at the sites are exposed (attributable to both work-related activities and traffic activities) do not exceed those experienced by their respective occupational groups. No adverse impacts are anticipated with implementation of Alternative 2.

Hazards will be minimized by the best management practices and occupational and radiological safety programs operating under the same regulatory standards and limits that currently apply at the NTS.

Emergency response programs will be employed to mitigate impacts of accidents to workers and the public in accordance with the 5500 series of DOE orders. These programs typically involve emergency planning, emergency preparedness, and emergency response. Each plan uses resources specifically dedicated to assist the facility in emergency management. These include a warning

communications center, fire departments, facility emergency command centers, a DOE emergency operations center, county and state emergency command centers, medical and industrial hygiene specialists, and protective clothing and equipment, such as respirators and breathing air supplies.

The radiation doses estimated in this EIS for the various radiological accident scenarios are the doses that would be received by the population if only limited protective actions were taken. The NTS has detailed plans for responding to accidents of the type described here, and the response activities would be closely coordinated with state and local officials. NTS personnel are trained and drilled in the protective actions to be taken if a release of radioactive or otherwise toxic materials occur. Even though this training may result in personnel receiving lower exposures should an accident occur, limited credit is taken for this training in estimating the exposure durations for workers.

For the off-site population, the need for any protective action would be based on the predicted radiation doses. The emergency response would be based on the guidance provided in the protective action guides developed by the EPA. The underlying principle for the protective action guides is that, under emergency conditions, all reasonable measures would be taken to minimize the radiation exposure to the general public and emergency workers. In the absence of significant constraints, protective actions may be implemented when projected doses are lower than the ranges given in the protective action guides.

7.12 Environmental Justice

The following supportive measures should be undertaken to mitigate Environmental Justice impacts:

- Continue to expand opportunities for low-income and minority communities to provide input within the public involvement process by seeking the constructive involvement of affected stakeholders

- Set in motion an Environmental Justice Strategy Implementation Plan, incorporating concerns expressed in Appendix G

- Continue to encourage the participation of the Consolidated Group of Tribes and Organizations in DOE-sponsored cultural resources investigations, including those associated with ground-disturbing activities such as environmental restoration

- Encourage Consolidated Group of Tribes and Organizations participation when developing educational programs, so that students and researchers receive proper guidance regarding how to interact with the physical environment and cultural landscape.

7.13 References

REGULATION, ORDER, LAW

10 CFR Part 1021.331	U.S. Department of Energy, "Energy: Mitigation Action Plans," *Code of Federal Regulations*, Office of Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

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Lyneis, 1982	Lyneis, M.M., *An Archaeological Element for the Nevada Historic Preservation Plan, Nevada Division of Historic Preservation and Archaeology*, University of Nevada, Las Vegas, NV, 1982.

Chapter 8

CONSULTATION AND COORDINATION

CHAPTER 8
CONSULTATION AND COORDINATION

The consultation and coordination efforts made by the DOE/NV during the preparation of this Final NTS EIS are summarized in this chapter. Meetings, briefings, and consultations were conducted with federal agencies and governments, state, county, tribal, and local. Some actions taken by the DOE/NV were mandated by regulations; other actions were initiated by the DOE/NV to further encourage participation in the National Environmental Policy Act process. Consulting and cooperating agencies have reviewed the Draft NTS EIS prior to and after its issuance, and provided comments which the DOE has addressed.

8.1 Cooperating Agencies

Four federal agencies and one county government served as cooperating agencies with the DOE/NV in accordance with Title 40 CFR Parts 1501.5 and 1501.6. The DOE/NV sought their cooperation to identify potential impacts to lands owned, administered, or managed by these agencies as a result of implementing its alternatives. Furthermore, the DOE/NV did not want its alternatives to be in conflict with the programs and policies of other agencies. And finally, specific areas of expertise within these agencies were critical to the DOE/NV for the evaluation of its alternatives. General functions applicable to all cooperating agencies were to:

- Provide land-use plans, National Environmental Policy Act documents, and other reference documents which could assist in the analysis
- Coordinate internal reviews and provide one set of comments for rough draft portions and all of the NTS EIS to assure consistency
- Ensure that ecosystem management concepts were applied to land-use impact analysis, where appropriate
- Attend and participate in periodic meetings of the technical working group, executive management group, and other appropriate groups; EIS scoping meetings, public meetings and hearings, and interagency meetings related to the NTS EIS; and assist, where applicable, with response to public comments.

The following briefly describes the specific contributions of the five cooperating agencies:

1. DoD, U.S. Air Force, Nellis Air Force Base: Provide noise analysis for the NTS EIS, as necessary, and serve as the subject matter expert for aircraft and airspace issues. Assist with impact analysis of remediation and monitoring activities of contaminated or potentially contaminated surface or groundwater as it might affect portions of the NAFR Complex.

2. DoD, Defense Nuclear Agency: Provide information on current and planned projects that are managed by the Defense Nuclear Agency, and assist with impact analysis.

3. Department of the Interior, U.S. Fish and Wildlife Service: To fulfill its obligations under the Endangered Species Act, the DOE/NV requested threatened and endangered species lists for the Central Nevada Test Area, Project Shoal Area, Tonopah Test Range/ Double Tracks and the Nevada Test Site at the beginning of the NTS EIS process. These lists are valid for 90 days and were periodically reauthorized throughout the NTS EIS process.

   In November 1995, the DOE/NV initiated formal Section 7 consultation with the U.S. Fish and Wildlife Service regarding effects of activities and programs proposed in the Draft NTS EIS on listed species. The U.S. Fish and Wildlife Service provided a Draft Biological Opinion on May 5, 1996, that concluded that the proposed activities were not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise. No critical habitat will be destroyed

or adversely modified. The U.S. Fish and Wildlife Service concurred with the DOE/NV that the programs will not affect the bald eagle or peregrine falcon. The DOE/NV has asked the U.S. Fish and Wildlife Service for a similar concurrence in the Final Biological Opinion that the programs will not affect Ash Meadows or Devils Hole.

4. Department of the Interior, Bureau of Land Management: Assist the DOE/NV in evaluating the adequacy of the existing DOE land withdrawals as they relate to the NTS EIS alternatives.

5. Nye County: Provide information regarding planning objectives and other information on long-term objectives of future Nye County planning initiatives. Provide information to assist in the evaluation of socioeconomic impacts of the NTS EIS alternatives.

8.2 American Indians

During the week of March 17, 1995, the DOE/NV met with the Consolidated Group of Tribes and Organizations to discuss American Indian involvement in the preparation of this EIS. The Consolidated Group of Tribes and Organizations recommended that two representatives from the Owens Valley Paiute, Western Shoshone, and Southern Paiute tribes be appointed to write an American Indian perspective for the NTS EIS. It was also recommended that the DOE/NV provide these representatives with funding and technical assistance. The DOE/NV agreed, and the American Indian Writers Subgroup (AIWS) was formed.

The Subgroup held its first meeting the week of May 1, 1995, in Las Vegas, Nevada, to develop a writing strategy, draft an outline of writing tasks, and begin preparing draft text. Subsequent meetings were held the week of May 22, 1995, and from June 9 through 12, 1995, to continue preparation and to finalize the draft text. At the June meeting, the development of the *Resource Management Plan* was outlined and continued American Indian involvement was discussed. A draft of American Indian Comments for the NTS EIS (Appendix G) was received by the DOE/NV June 15, 1995. The appendix provided an overview of the cultural basis for the viewpoints presented by the Consolidated Group of Tribes and Organizations' members in the Draft NTS EIS.

Two subgroup meetings were held in Las Vegas, Nevada, after the public review period for the Draft NTS EIS. The purpose of these meetings was to review and edit the Draft American Indian Comments, to respond to the public comments on the Draft document, and to prepare additional text for inclusion in the NTS EIS. On March 20 and 21, 1996, the Subgroup met with DOE/NV management officials to discuss the current American Indian involvement in the NTS EIS as well as other consultation issues. A brief presentation of the *Resource Management Plan* was also given by the DOE/NV.

On April 15 through 17, 1996, DOE/NV again consulted with Consolidated Group of Tribes and Organizations' representatives to update them on the changes, final schedule, and public comments for the NTS EIS. This meeting was held at the NTS. The AIWS presented a report of activities and a status of writing tasks completed. The Consolidated Group of Tribes and Organizations reviewed and commented on the additional text developed by the Subgroup and provided suggestions for expanding sections of the text.

On April 18 through 21, 1996, the Subgroup met in Las Vegas to incorporate the Consolidated Group of Tribes and Organizations' comments, to complete and edit the additional text, to focus writing efforts on the Transportation Study and the *Resource Management Plan*, and to complete an expanded inventory of American Indian traditional-use plants and animals. On April 21, 1996, the Subgroup completed all additional text for Appendix G as well as sections to be incorporated into Volumes 1 and 2 of the NTS EIS. The final additions for the American Indian Assessments for the NTS EIS (Appendix G) were submitted to DOE/NV.

8.2.1 American Indian Consultation Procedures

American Indian tribes are sovereign nations that acknowledge the U.S. Government and expect that,

in return, the U.S. Government recognize tribal sovereignty. In a memorandum dated April 29, 1994, President William J. Clinton wrote, "I am strongly committed to building a more effective day-to-day working relationship reflecting respect for the rights of self-government due the sovereign tribal rights." American Indian governments expect that federal agencies and state officials will honor President Clinton's explicit commitment to building such a relationship and following his mandate (Executive Orders 12875 and 12866). Accordingly, government officials must implement comprehensive consultation policies that take into consideration the vast cultural, social, and political diversity of American Indians as well as the needs, concerns, and impacts that are shared by our nations.

American Indian tribes are not considered as, nor do they fit the definition of, businesses or stakeholders. Formal government-to-government consultation with tribal governments require diplomacy. U.S. Government officials that are in charge of maintaining friendly and productive day-to-day relationships with foreign countries, such as Japan, Mexico, or Germany, must acquire knowledge on the languages, culture, and politics of those countries in order to best represent the interests of the United States, and to achieve success in international, economic, and political negotiations. Yet, there is little or no interest among government officials to educate themselves as to how American Indians living in their own country organize themselves culturally and politically. How, we ask, are federal agencies and state officials going to succeed in following President Clinton's mandate, if they do not work at improving their knowledge of American Indian life ways?

The American Indian Writers Subgroup (AIWS), which represents the concerns of the CGTO for the Nevada Test Site Environmental Impact Statement would like to suggest a series of procedures for implementing a comprehensive day-to-day consultation relationship with the U.S. Department of Energy (DOE). The Environmental Protection Division of the U.S. Department of Energy, Nevada Operations Office (DOE/NV) has maintained its commitment to consultation and established a working relationship with culturally affiliated American Indian tribes regarding cultural resources at Yucca Mountain and the NTS since 1985. There are, however, numerous other areas of great concern for tribal governments that are currently addressed in the NTS EIS but have not been explored nor systematically subjected to consultation with tribal governments. Some of these areas are:

- *Land use*
- *Risk assessment*
- *Socioeconomic issues*
- *Nuclear waste transportation*
- *Environmental justice and equity*
- *Environmental restoration*
- *Mitigation.*

The AIWS is aware that presently there are programmatic EISs taking place without the direct involvement of Indian people. This lack of involvement is a source of great concern for culturally affiliated tribes. The gravity of past and proposed future nuclear and defense-related programs and activities at the NTS and other areas withdrawn by the DOE calls for a broadening of the scope of American Indian consultation programs. As stated in the American Indian Policy (April 29, 1994), the DOE must identify and seek to remove impediments to working directly and effectively with tribal governments on DOE programs and activities. The DOE has already recognized that there may be certain procedural impediments which limit or restrict the ability to work effectively and consistently with American Indian tribes. In keeping with the American Indian Policy, which requires government-to-government consultation, this federal agency must make every effort to remove such impediments.

The AIWS reviewed and edited the Consultation Model produced for the DOE Legacy Project (Stoffle et al., 1994). A detailed version of this American Indian Consultation Model, which has

been tailored to meet current DOE/NV consultation procedures, is included in Attachment C of Appendix G.

The consultation procedures are drawn both from past and current consultation relationships between DOE/NV and the CGTO. Furthermore, these procedures reflect the need for adjustments on consultation strategies for future DOE programs and activities that may potentially impact the traditional culture and contemporary well-being of Indian people. Therefore, discussions presented in Appendix G not only highlight the accomplishments of DOE/NV consultation with tribal governments, but also points out procedures that have yet to be developed and implemented in the future. Because the NTS EIS will be read by government officials from sister DOE facilities and perhaps by other federal and state agencies as well, the AIWS expects that the consultation procedures will serve as a model for future interaction between tribal governments and federal and state agencies.

It is important to note that specific consultation procedures should be approved by tribal governments at the onset of each consultation process.

8.3 Other Meetings

Additional meetings were held with local governments, advisory boards, the Nevada State Clearinghouse, the DOE/NV Operations Office Environmental Management Community Advisory Board, affected units of local government, and the South-Central Nevada Federal Complex Advisory Board. Several work-group meetings with local and county governments took place, many of which were specific to transportation issues. These meetings are summarized in Table 8-1.

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 1 of 5)

Host Organization	Date	Location
Environmental Impact Statement Transportation Study Meetings		
Local or County Government	August 22, 1994	U.S. Department of Energy Nevada Operations Office 2753 S. Highland Las Vegas, NV 89109
University of Nevada, Las Vegas	November 15, 1994	University of Nevada, Las Vegas Harry Reid Center 4505 S. Maryland Parkway Las Vegas, NV 89154
Transportation Risk Working Group Meetings		
DOE Nevada Operations Office	May 16, 1995	U.S. Department of Energy Nevada Operations Office 2753 S. Highland Las Vegas, NV 89109
DOE Nevada Operations Office	June 15, 1995	IT Corporation 4330 S. Valley View, #114 Las Vegas, NV 89103

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 2 of 5)

Host Organization	Date	Location
Draft Implementation Plan Meetings		
Community Advisory Board for the NTS Programs	February 1, 1995	Holiday Inn Crowne Plaza 4225 Paradise Road Las Vegas, NV 89109
DOE Nevada Operations Office	February 7, 1995	University of Nevada, Las Vegas 4505 S. Maryland Parkway Las Vegas, NV 89154
DOE Nevada Operations Office	February 9, 1995	University of Nevada 9th and N. Virginia Reno, NV 89557
DOE Nevada Operations Office	March 7, 1995	U.S. Department of Energy Nevada Operations Office 2753 S. Highland Las Vegas, NV 89109
DOE Nevada Operations Office	March 9, 1995	Reno-Sparks Convention and Visitors Authority 4590 S. Virginia St. Reno, NV 89501
Scoping Period Meetings		
DOE Nevada Operations Office	September 7, 1994	Fallon Convention Center 100 Campus Way Fallon, NV 89046
DOE Nevada Operations Office	September 8, 1994	Carson City Community Center 851 E. Williams Street Carson City, NV 89701
DOE Nevada Operations Office	September 13, 1994	Dixie Center Convention Facilities 425 South 700 East St. George, UT 84770
DOE Nevada Operations Office	September 15, 1994	Tonopah Convention Center 301 Brougher Tonopah, NV 89049
DOE Nevada Operations Office	September 20, 1994	Cashman Field Convention Center 850 Las Vegas Boulevard No. Las Vegas, NV 89101

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 3 of 5)

Host Organization	Date	Location
DOE Nevada Operations Office	September 21, 1994	Bob Ruud Community Center Highway 93 Caliente, NV 89008
DOE Nevada Operations Office	October 4, 1994	Henderson Convention Center 200 S. Water Street Henderson, NV 89015
Other Information Meetings		
State of Nevada Clearinghouse	August 30, 1994	State Clearinghouse II Capitol Complex Carson City, NV 89710
Environmental Management Community Advisory Board	October 5, 1994	Holiday Inn Crowne Plaza 4225 Paradise Road Las Vegas, NV 89109
Affected Units of Local Government	October 21, 1994	White Pine County Convention Center 150 6th Street Ely, NV 89301
South-Central Nevada Federal Complex Advisory Board	October 28, 1994	Tonopah Convention Center 301 Brougher Tonopah, NV 89049
Air and Waste Management Association	December 14, 1994	Palace Station Hotel & Casino 2411 West Sahara Las Vegas, NV 89102
State of Nevada Clearinghouse	December 19, 1994	Nevada State Library Capitol Complex Carson City, NV 89710
Affected Units of Local Government	February 24, 1995	Tonopah, NV 89049
CGTO	March 17 - 19, 1995	Nevada Test Site Mercury, NV 89023
State of Nevada Clearinghouse	April 19, 1995	Nevada State Library Capitol Complex Carson City, NV 89710
Affected Units of Local Government	May 25, 1995	Pioche Fire Department Pioche, NV 89043
Community Technical Representative Program	July 31 - August 4, 1995	Brian Head Hotel 223 W. Hunter Ridge Drive Brian Head, UT 84719

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 4 of 5)

Host Organization	Date	Location
Environmental Management Community Advisory Board	August 2, 1995	Community College of Southern Nevada Cheyenne Campus North Las Vegas, NV 89030
Transportation Study Group	August 9, 1995	Desert Research Institute 755 E. Flamingo Road Las Vegas, NV 89119
State of Nevada Clearinghouse	August 29, 1995	Nevada State Library Capitol Complex Carson City, NV 89710
Environmental Management Community Advisory Board	October 8, 1995	Community College of Southern Nevada Cheyenne Campus North Las Vegas, NV 89030
Public Hearings, Workshops, and Other Meetings		
Environmental Management Community Advisory Board	February 7, 1996	Durango High School 7100 W. Dewey Drive Las Vegas, NV
NTS EIS Public Hearing	March 5, 1996	Dixie College Smith Convention Center 425 South 700 East St. George, UT 84770
NTS EIS Public Hearing	March 13, 1996	Town of Pahrump Bob Rudd Community Center 50 North Highway 160 Pahrump, NV 89041
NTS EIS Public Hearing	March 19, 1996	University of Nevada ASUN Auditorium Reno, NV 89557-0089
NTS EIS Public Hearing	March 26, 1996	Cashman Field Center 850 Las Vegas Blvd. No. Las Vegas, NV 89101
NV State Clearinghouse Meeting	April 10, 1996	Nevada State Library 100 Stewart Avenue Carson City, NV 89710

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 5 of 5)

Host Organization	Date	Location
NTS Transportation Big Group	April 11, 1996	Bechtel Nevada Facilities Bldg. C-1, Auditorium 2621 Losee Road North Las Vegas, NV 89030
Public Hearings, Workshops, and Other Meetings		
NTS EIS CORE Workshops	April 8, 1996	Boulder City Hall Bldg. 401 California Avenue Boulder City, NV 89005
NTS EIS CORE Workshops	April 16, 1996	Caliente Train Station 100 Depot Avenue Caliente, NV 89008
NTS EIS CORE Workshops	April 23, 1996	Tonopah Courthouse Commissioners Chambers W. P. Beko Justice Chambers 101 Radar Road Tonopah, NV 89049
NTS EIS CORE Workshops	April 25, 1996	West Las Vegas Arts Center 947 W. Lake Mead North Las Vegas, NV

8.4 References

REGULATION, ORDER, LAW

40 CFR Part 1501.5 — U.S. Environmental Protection Agency (EPA), "Protection of the Environment: Lead Agencies," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

40 CFR Part 1501.6 — EPA, "Protection of the Environment: Cooperating Agencies," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

EO 12866 — Executive Order, "*Regulatory Planning and Review*," Office of the President, Washington, DC, 1993.

EO 12875 — Executive Order, "*Enhancing the Intergovernmental Partnership*," Office of the President, Washington, DC, 1993.

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Stoffle, et al., 1994 — Stoffle, R.W., M.J. Evans, D.B. Halmo, M.F. Dufort, and B.K. Fulfrost, *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*, Desert Research Institute Technical Report No. 84, Bureau of Applied Research in Anthropology (BARA), University of Arizona, Tucson, AZ, 1994.

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Chapter 9

LIST OF PREPARERS AND CONTRIBUTORS

CHAPTER 9
LIST OF PREPARERS AND CONTRIBUTORS

9.1 Preparers

The following individuals were primarily responsible for writing the contents of this Final EIS or for providing senior management leadership during the development and production phases of this document.

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- **EIS Contributions**: Principal Investigator - Socioeconomic

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GLOSSARY

100-year flood. A flood event of such magnitude that it occurs, on average, every 100 years. This equates to a 1-percent probability of occurring in any given year.

A-weighted decibel (dBA). See Decibel, A-weighted.

Absorbed dose. The energy imparted to matter by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose is the rad, which equals 100 ergs per gram.

Ad valorem taxes. A Latin term meaning "according to value" and referring to taxes levied on the assessed valuation of real and personal property, including automobiles.

Air Traffic Control Assigned Airspace. Airspace of defined vertical/lateral limits assigned by Air Traffic Control, for the purpose of providing air traffic separation between the specified activities being conducted within assigned airspace and other instrumental flight rules air traffic. Procedure governing operations within these areas shall be specified in letters of agreement between local military authorities and the air traffic control facility.

Aircraft operation. Air traffic control-related air activity that is counted as follows: (1) count an arrival as one operation; (2) count a departure as one operation; (3) count aircraft touch and go landings as two operations; (4) count an approach followed by a waveoff as two operations; (5) count aircraft that transit the control area of jurisdiction and are provided air traffic control service as one operation (count formation flights in this category as one operation except as provided in 6; (6) count individual aircraft in a formation as one operation when that formation is operating to/from/within an airport traffic area or within special-use airspace.

Alluvial fan. A pattern of sediment deposit caused by running water.

Alluvium. Any stream-laid sediment deposit.

Alpha activity. The emission of alpha particles by fissionable material (uranium or plutonium).

Alpha particle. A positively charged particle, consisting of two protons and two neutrons, that is emitted during radioactive decay from the nucleus of certain nuclides. It is the least penetrating of the three types of radiation (alpha, beta, and gamma).

Ambient. Surrounding or background conditions in the absence of an identifiable source.

Ambient air. That portion of the atmosphere, outside of buildings, to which the general public has access.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated criteria pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters less than 10 microns (PM_{10})., ozone, and lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards). See Criteria Pollutants.

Apron. An outwash plain composed of sediments washed out from the ice.

Aquifer. A body of rock that contains enough saturated permeable material to transmit groundwater and to yield significant quantities of groundwater to wells and springs.

Area of potential effect. In the context of Section 106 of the National Historic Preservation Act, the area in which planned development may directly or indirectly affect a cultural resource.

Areal. The measure of a planar region or of the surface of a solid.

As low as reasonably achievable (ALARA). An approach to radiation protection designed to manage and control individual and collective radiation doses to the workforce and the general public and to ensure that exposure is kept to the lowest level reasonably achievable. The ALARA approach considers aspects of the social, technical, economic, practical, and public impacts.

Assessed valuation. A valuation set upon real estate or other property by a government as a basis for levying taxes. For example, in most municipal jurisdictions in Clark and Nye counties, 35 percent of the taxable value placed upon real and personal property by the chief appraiser of the appraisal district is used as the basis for levying property taxes.

Attainment area. A region that meets the National Ambient Air Quality Standards for a criteria pollutant under the Clean Air Act.

Attenuation. Weakening, reducing the severity.

Average annual daily traffic. For a one-year period, the total volume passing a point or segment of a highway facility in both directions, divided by the number of days in the year.

Background radiation. Radiation from cosmic sources and from radioactive materials that are naturally occurring in the environment. Background radiation due to cosmic rays and natural radioactivity is always present.

Baseline. The initial environmental conditions against which the environmental consequences of various alternatives are evaluated.

Beta activity. The emission of beta particles by radioisotopes.

Beta particle. An elementary particle emitted from a nucleus during radioactive decay; it is negatively or positively charged, identical in mass to an electron, and in most cases easily stopped, as by a thin sheet of metal.

Biocide. A substance that is hazardous to many different organisms.

Biome. A major ecological community.

Byproduct waste. Tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Caches. A hole or similar hiding place used for concealment or safekeeping.

Caliche. A desert soil formation consisting of near-surface crystallization of calcite or other soluble minerals by upward movement of solutions.

Candidate species. Species for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support the issuance of a proposed rule to list but issuance of the proposed rule is precluded.

Capacity (traffic). The maximum rate of flow at which vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions.

Capital projects fund. A fund used to account for financial resources for the acquisition or construction of major capital facilities.

Carbon-14. An isotope of carbon that occurs both naturally and from the decay of certain radioactive isotopes. Carbon-14 is a well-known tool used to date archaeological finds. Carbon-14 can be generated from wastes as a gas and can rise upward to the surface if precautions are not taken.

Carbon monoxide. A colorless, odorless, poisonous gas produced by incomplete fossil-fuel combustion. One of the six pollutants for which there is a national ambient standard.

Cavity. An underground void created in the rock by the shock wave and heat from an underground nuclear detonation.

Census blocks. Cluster of blocks within the same census tract. Census blocks do not cross county or census tract boundaries and generally contain between 250 and 550 housing units.

Chimney. A tall, roughly cylindrical volume of broken rock and rubble formed underground by the collapse of the overlying medium (overburden) into the cavity.

Class I, II, and III areas. Under the Clean Air Act, clean air areas are divided into three classes. Very little pollution increase is allowed in Class I areas, some increase in Class II areas, and more in Class III areas. National parks and wilderness areas receive mandatory Class I protection. All other areas start out as Class II. States can reclassify Class II areas up or down, subject to federal requirements.

Classified waste. Weapons components and assemblies designated by the U.S. Government, pursuant to Executive Order, statute, or regulation, that require protection against unauthorized information or material disclosure for reasons of national security. Additional security and safeguards management activities are required in the handling of these materials.

Clastic. Pertaining to a rock or sediment composed principally of broken fragments that are derived from preexisting rocks or minerals and that have been transported some distance from their place of origin.

Coefficient. A numerical factor of an elementary algebraic term, as "4" in the term "4x."

Collective effective dose equivalent (person-rem). A summation of the radiation doses received by individuals in an exposed population dose. See population dose.

Colluvium. A general term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity, e.g., talus material or cliff debris.

Corrective Action Unit. A Resource Conservation and Recovery Act (RCRA) controlled cleanup unit for which owners and operators are required to perform corrective actions to address release of hazardous wastes.

Corridor. A strip of land of various widths on both sides of a particular linear facility, such as a highway, rail line, or utility line.

Council manager. A form of government whereby a full-time appointed manager oversees the day-to-day operations of the government. The nonpartisan elected council provides policy and direction to the manager.

Counterproliferation. Efforts taken by the U.S. government to combat the international proliferation of weapons that can cause mass destruction.

Criteria pollutants. The Clean Air Act required the U.S. Environmental Protection Agency to set air quality standards for common and widespread pollutants after preparing criteria documents summarizing scientific knowledge on their health effects. Today there are standards for six criteria pollutants: sulfur dioxide, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), nitrogen dioxide, ozone, and lead.

Cumulative impact. The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Curie (ci). A unit of radiation that describes the number of atoms undergoing nuclear transformations per unit time, i.e., 3.7×10^{10} disintegrations per second.

Daughter products. Nuclides resulting from the radioactive disintegration of a radionuclide, formed either directly or as the result of successive transformations in a radioactive series. A daughter product may be either radioactive or stable.

Day-night average sound level. A-weighted sound-pressure levels averaged over a 24-hour period with 10 dBA added for events occurring between 10 p.m. and 7 a.m.

Debt service fund. A fund accounting for the accumulation of resources for, and the payment of, interest and principal on general long-term debt.

Decibel. A standard unit for measuring sound-pressure levels based on a reference sound pressure of 0.0002 dynes per square centimeter. This is the smallest sound a human can hear.

Decibel, A-weighted (dBA). Adjusted unit of sound measurement that corresponds to the relative sensitivity of the human ear at specified frequency levels. This represents the loudness as perceived by humans.

Decontamination and decommissioning. The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive contamination from facilities, soil, or equipment by washing, chemical action, mechanical cleaning, or other techniques, and then removing such from operation.

Diagnostic canister. A canister used in a nuclear test that contains the instrumentation necessary to receive data from the explosion.

Dipole hail. Defense Nuclear Agency program which consists of a series of high explosive experiments in different media to determine levels of disruption to underground facilities.

Direct impact. Effects resulting solely from the proposed program.

Direct effects. Beneficial or deleterious impacts that are caused by an action and occur at the same time and place.

Dose equivalent. The product of the absorbed dose in the tissue or organ of interest, the applicable quality factor(s), and all other necessary modifying factors at the point of interest.

Dynamic experiment. An experiment to provide information regarding changes in materials under conditions caused by the detonation of high explosives. Dynamic experiments are used to gain information on the physical properties and dynamic behavior of materials used in nuclear weapons, including changes due to aging.

Effective dose equivalent. The sum of the products of the dose equivalent to a tissue or organ and the weighting factor applicable to that tissue or organ for all tissues and organs irradiated.

Effluent. A gas or fluid discharged into the environment.

Endangered species. A plant or animal species that is threatened with extinction or serious depletion in its range and is formally listed as such by the U.S. Fish and Wildlife Service.

Environmental Impact Statement. A detailed written statement that helps public officials make decisions that are based on understanding of environmental consequences and to take actions that protect, restore, and enhance the environment.

Eolian. Applied to deposits arranged by the wind. Wind blown.

Ephemeral. Lasting only a brief period of time.

Equivalent sound level (L_{eq}). A single-number representing the fluctuating sound level in decibels over a specified period of time. The average of a fluctuating level of sound energy.

Escarpment. A long cliff or steep slope.

Evapotranspiration. The loss of water from the soil both by evaporation and by transpiration from the plants growing there.

Exclusion zone. The area around ground zero where there is a potential for subsidence.

Fiscal year. A 12-month period of time to which the annual budget applies and at the end of which its financial position and the result of its operations are determined. Clark County, the city of Las Vegas, the city of North Las Vegas, Nye County, the towns of Tonopah and Pahrump, and the Clark County School District and Nye County School District fiscal years run from July 1 through the following June 30. Federal fiscal years are from October 1 through the following September 30.

Fissile. Capable of undergoing fission by interaction with thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

Fission. A nuclear transformation characterized by the splitting of a nucleus and the simultaneous release of energy.

Fission products. A complex mixture of radioactive nuclides produced as a result of nuclear fission.

FORTRAN. A computer programming language for problems that can be expressed in algebraic terms.

Friable. Easily crumbled or pulverized.

Fugitive dust. Particulate matter composed of soil. Fugitive dust may include emissions from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is either removed or redistributed.

Fugitive emissions. Emissions released directly into the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.

Future baseline. As used in the socioeconomic sections of this document, the future baseline of economic indicators and population are provided by the Alternative 1 and projected to the year 2005. Economic indicators and population for all other alternatives are compared against this future baseline to determine the specific impact of the alternative. In other words, the economic growth of an alternative in a certain year can be determined, and the future baseline for that year is subtracted, leaving the economic impact specifically associated with the alterative.

Gabion. Large cage.

Gamma ray. Short wavelength electromagnetic radiation, with no mass, that is emitted from the nucleus.

General aviation. All aircraft that are not commercial or military aircraft.

Geologic. Any natural process acting as a dynamic physical force on the Earth; i.e. faulting, erosion, and mountain-building resulting in rock formations.

Geologic media. Refers to the characteristics of the rock or soil type at a specific site.

Grant. A contribution by a government or other organization to support a particular function. Grants may be classified as either categorical or block, depending upon the amount of discretion allowed the grantee.

Greater-Than-Class C waste. Low-level waste that is generated by the commercial sector and that exceeds U.S. Nuclear Regulatory Commission concentration limits for Class-C low-level waste as specified in 10 CFR Part 61. DOE is responsible for the disposal of greater-than-Class-C wastes from the DOE nondefense program.

Groundshine. The irradiation caused by the radioactivity which is deposited on the ground.

Groundwater. Subsurface water within the zone of saturation.

Groundwater recharge. Water that infiltrates the land surface and is not lost to evaporation or consumed by plants can percolate downward and replenish the groundwater aquifers. This deep percolation is called recharge. Much of the recharge at the NTS is from mountainous areas as much as 48 km (30 mi) away.

Grubbing. To clear of roots and stumps by digging.

Hazardous waste. Wastes that are designated as hazardous by the Environmental Protection Agency (EPA) or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act, is waste from production or operation activities that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes that appear on

special EPA lists or possess at least one of the four following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

HEAST. Acronym for Health Effects Assessment Summary Tables.

Highly enriched uranium. Uranium in which the abundance of the isotope uranium-235 is increased well above the normal (naturally occurring) levels.

High-level waste. The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing of and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Human environment. The natural and physical environment and the relationship of people with the environment.

Human intruder. A hypothetical individual (in a future scenario) who unknowingly contacts the waste(s) in a disposal unit(s) after the loss of institutional control and with no prior knowledge of the waste disposal activities at the site. Intrusion scenarios include, but are not limited to, drilling into the waste or farming on or near the waste disposal facility.

Hydrocarbons. Any of a vast family of compounds containing hydrogen and carbon. Used loosely to include many organic compounds in various combinations. Most fossil fuels are composed predominately of hydrocarbons.

Hydrodynamic test. A dynamic, integrated systems test of a mock-up nuclear package during which the high explosives are detonated and the resulting motions and reactions of materials and components are observed and measured. The explosively generated high pressures and temperatures cause some of the materials to behave hydraulically (like a fluid). Hydrodynamic tests are used to obtain diagnostic information on the behavior of a nuclear weapon's primary assembly (using simulant materials for the fissile materials in an actual weapon) and to evaluate the effects of aging on the nuclear weapons remaining in the greatly reduced stockpile.

Hydrology. A science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere.

Hydronuclear experiment. Very low-yield experiment (less than a few pounds of nuclear energy released) to assess primary performance and safety with normal detonation.

Impoundment. To accumulate, as water in a reservoir.

Inertia. That property of a body by virtue of which it offers resistance to a change of its motion of translation.

Infiltration. Water that falls on the land surface that does not runoff but percolates into the ground. Some of this water evaporates, some is used by plants, and some percolates downward to the groundwater.

Infrastructure. Utilities and other physical support systems needed to operate a laboratory or test facility. Included are electric distribution systems, water supply systems, sewage disposal systems, roads, and so on.

Intergovernmental revenues. Revenues received from federal, state, and local sources, such as grants and taxes.

Intermodal. Involving more than one form of carrier during a single transport.

Inertial confinement fusion. A laser initiated nuclear fusion using the inertial properties of the reactants as a confinement mechanism.

IRIS. Acronym for Integrated Risk Information System.

Isopleth. A line, on a map or chart, drawn through points of equal size or abundance.

Isotope. Nuclides having the same number of protons in their nuclei, and hence the same atomic number, but differing in the number of neutrons, and therefore in the mass number. Almost identical chemical properties exist between isotopes of a particular element. The term should not be used as a synonym for nuclide.

Iterative. To say or do repeatedly; involving repetition.

Level of service (public services). A measure describing the amount of public services (e.g., fire protection and law enforcement services) available to community residents, generally expressed as the number of personnel providing the services per 1,000 population.

Level of service (traffic). A qualitative measure describing operational conditions within a traffic stream and how they are perceived by motorists and/or passengers.

Limiting concentrations. The radioactivity that remains in a waste after treatment that poses a limitation or bounding condition to disposal options. The radionuclide that tends to be most mobile, or has the highest potential to affect human health and the environment, becomes the limiting factor for the disposal facility.

Lithic. Made of or related to stone.

Logarithm. The exponent indicating the power to which a fixed number, the base, must be raised to produce a given number.

Low-enriched uranium. Naturally occurring uranium contains only about 0.7 percent U-235 and almost all of the rest is U-238. Low-enriched uranium is enriched in the isotopic content of U-235, greater than 0.7 percent but less than 20 percent of the total mass, for use as light water reactor fuel.

Low-level mixed waste. Low-level waste that also includes hazardous components, as identified in Title 40 CFR Part 261, Subparts C and D.

Low-level waste. Radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nCi per gram.

Maximum individual dose. A radiation dose received by a hypothetical individual whose location and habits are such that the dose received is the maximum expected to result from some given operation or accident.

Military training route. A route developed for the high-speed (greater than 250 knots) low-altitude training of tactical aircrews. Instrument flight rules military training routes are mutually developed by the Federal Aviation Administration and the U.S. Department of Defense (DoD). Visual flight rules military training routes are developed by DoD. Military training routes are published on aeronautical charts. Each military training route has its own unique number consisting of either three or four digits. Three digits indicate that at least one segment of the route is 1,500 feet above ground level, and four digits indicate that the entire route is at or below 1,500 feet above ground level. The number is preceded by either IR or VR, specifying instrument flight rules or visual flight rules, respectively. Since routes are one way, the same route flown the opposite direction will have a separate, distinct number.

Mitigation. Actions and decisions that (1) avoid impacts altogether by not taking a certain action or parts of an action, (2) minimize impacts by limiting the degree or magnitude of an action, (3) rectify the impact by repairing, rehabilitating, or restoring the affected environment, (4) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action, or (5) compensate for an impact by replacing or providing substitute resources or environments.

Mixed waste. Waste containing both radioactive and hazardous components, as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively. Mixed waste intended for disposal must meet the Land Disposal Restrictions as listed in Title 40 CFR Part 268. Mixed waste is a generic term for specific types of mixed waste such as low-level mixed waste, and transuranic mixed waste.

Moratorium. A waiting period set by an authority—a suspension of activity.

Moving average. A method consisting of computing an average of the most recent "n" data values in the time series. This average is then used as a forecast for the next period.

National Priority List. A list of sites (federal and state) that contain hazardous materials that may cause an unreasonable risk to the health and safety of individuals, property, or the environment.

National Ambient Air Quality Standards. Section 109 of the Clean Air Act requires the Environmental Protection Agency to set nationwide standards, the National Ambient Air Quality Standards, for widespread air pollutants. Currently, six pollutants are regulated: sulfur dioxide, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), nitrogen dioxide, ozone, and lead.

Neutron activation product. The absorption of one or more neutrons into the nucleus of an atom resulting in a new isotope.

Nitrogen dioxide. Gas formed primarily from atmospheric nitrogen and oxygen when combustion takes place at high temperature. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone. See Criteria Pollutants.

Nitrogen oxides. Gases formed primarily by fuel combustion, which contribute to the formation of acid rain. Hydrocarbons and nitrogen oxides combine in the presence of sunlight to form ozone, a major constituent of smog.

Noise. Any sound that is undesirable because it interferes with speech and hearing or is intense enough to damage hearing.

Nonattainment area. An area that has been designated by the U.S. Environmental Protection Agency or the appropriate state air quality agency as exceeding one or more national or state Ambient Air Quality Standards.

Nondispersible. Cannot be scattered or spread.

Nonpotable. Water that is unsafe or unpalatable to drink because it contains pollutants, contaminants, minerals, or infective agents.

Nonproliferation. The use of political, economic, and military means to prevent the spread of weapons that cause mass destruction or protect the United States' interests against countries with such weapons.

Nonstochastic. Not random, not involving chance.

Notice of Intent. A notice that an environmental impact statement will be prepared and considered.

Nuclear testing. An underground nuclear weapons test of either a single underground nuclear explosion or two or more underground nuclear explosions conducted at the NTS within an area delineated by a circle having a diameter of two kilometers and conducted within a total period of 0.1 second. The yield of a test shall be the aggregate yield of all explosions in the test.

Operable unit. Division of cleanup of a release site into discrete action units that eliminate or mitigate a release, a threat of a release, or an exposure pathway.

Ozone (ground level). A major ingredient of smog. Ozone is produced from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight and heat.

Paleontological resources. Fossils.

Parabolic. Having the form of a conic section taken parallel to an element of the intersected cone.

Particulate. Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Pathogenic. Causing or capable of causing disease.

Peak hour (traffic). The hour of highest traffic volume on a given section of roadway.

Percutaneous. Absorbed through the skin.

Piedmont. Lying or formed at the base of the mountains.

Platform. The area of thinner sediments adjoining a geosynclinal wedge of thicker equivalent beds.

Pathway. The route by which a contaminant reaches a human receptor. Common pathways considered in performance assessments include, but are not limited to, air, groundwater, and surface water.

Playa. A dry, vegetation-free, flat area at the lowest point of an undrained basin.

Population dose (person-rem). A summation of the radiation doses received by individuals in an exposed population. Equivalent to collective dose.

Porosity. The percentage of the volume of rock that is occupied by pore spaces.

Primary roads. A consolidated system of connected main roads important to regional, statewide, and interstate travel. They consist of rural arterial routes and their extensions into and through urban areas of 5,000 or more population.

Protective levels. Those levels which would meet acceptable human health and risk factors based on future land uses, as established through the Federal Facility Agreement and Consent Order process.

Quality factor. A factor which is used to account for the difference in biological effectiveness for different types of radiation. The quality factor is directly related to the energy deposited per unit path length by radiation in traversing a tissue or organ.

Radiation. The emissions, either electromagnetic or particulate, resulting from the transformation of an unstable atom or nucleus.

Radioactive decay. The process in which a nucleus emits radiation and undergoes spontaneous transformation into one or more different nuclei.

Radioactive source-term. Initial quantity of radionuclides at a release point from which dose rate and total dose as a function of distance from the release point may be calculated after accounting for radioactive decay and atmospheric dispersal.

Radioactive waste. Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

Radioactive Waste Management Site. Designated location where radioactive waste handling, storage, or disposal operations are conducted under management control.

Radioisotopes. Radioactive nuclides of the same element (same number or protons in their nuclei) that differ in the same number of neutrons.

Radionuclide. Radioactive particle, man-made or natural, with a distinct atomic weight number. Can have a long life as soil or water pollutants.

RADTRAN. A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

Receptors. Plants, animals, and people that may be exposed to contamination. A receptor can be exposed via the air and soil pathways (for example, by inhalation, ingestion, and contact), and the surface and groundwater pathways (by contact and ingestion).

Record of decision. A public document that explains which cleanup alternative will be selected for the area of concern.

Rem. A unit of dose equivalent or effective dose equivalent equal to the product of the absorbed dose in rad, the applicable quality factor(s), all other necessary modifying factors, and the applicable weighting factors as appropriate.

Remediate. The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

Render-safe mission. A means to make a nuclear weapon secure from unwanted detonation.

Repository. A mined, deep geologic disposal facility for spent nuclear fuel and high-level radioactive waste.

Residuals. The composition and form of a waste after treatment. For example, solidified incineration ash would be a residual.

Restricted area (airspace). Airspace designated under Federal Acquisition Requirements Part 73 within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Restricted areas are designated when determined necessary to confine or segregate activities considered to be hazardous to nonparticipating aircraft.

Retrofit (facility). Addition of a pollution control device on an existing facility without making major changes to the generating plant.

Retrofit (weapon). Modification of the components of an existing weapon without making major changes to the basic design.

Riparian. The banks of a body of water.

Riprap. A loose assemblage of stones or other materials used in water or soft ground to prevent erosion.

Rod claddings. An external layer of material applied directly to nuclear fuel rods or other material to provide protection from a chemically reactive environment, to provide containment of radioactive products produced during the irradiation of the composite, or to provide structural support.

Roentgen (R). A unit of the amount of exposure to electromagnetic, ionizing radiation. One R is the amount of electromagnetic, ionizing radiation necessary to generate 2.58×10^{-4} coulombs of electric charge in one kilogram of dry air at standard temperature and pressure.

Scope. The range of actions, alternatives, and impacts to be considered in an environmental impact statement.

Significant. The common meaning of significant is; "having or likely to have considerable influence or effect." As it pertains to the National Environmental Policy Act, "significant" requires that both context and intensity be considered in evaluating impacts (40 CFR Part 1508). Context could include surrounding circumstances such as society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the severity of the impact, and requires that several factors be evaluated. These factors may include the degree to which public health and safety are affected, unique characteristics of the geographic area, and others.

Skarn. Metamorphic rock rich in iron.

Source Material. Initial quantity of any material released into the environment.

Source-term. An initial quantity of any material released into the environment from which concentrations are a function of distance and may be estimated from calculational models which account for radiological/chemical decay and atmospheric dispersal.

Special nuclear materials. As defined in Section 11 of the Atomic Energy Act of 1954, special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Nuclear Regulatory Commission determines to be special nuclear material or (2) any material artificially enriched by any of the foregoing.

Special revenue fund. A fund that accounts for the proceeds of specific revenue sources that are legally restricted to expenditures for specified purposes.

Specific activity. The concentration of radioactivity, given as the number of Becquerels (Bq) or curies (Ci) per unit mass or volume.

Spent fuel. Nuclear reactor fuel that, through nuclear reactions, has been sufficiently depleted of fissile material to require its removal from the reactor.

Stakeholder(s). Interested and/or affected people or groups.

Stockpile stewardship. The science and technology aspects of ensuring the safety, security, and reliability of the United States' stockpile of nuclear weapons, including research and development to provide the technologies required for stockpile management. This includes a program of activities to maintain confidence in the safety, reliability, and performance of the stockpile.

Storage. The collection and containment of waste or spent nuclear fuel in such a manner as not to constitute disposal of the waste or spent nuclear fuel for the purposes of awaiting treatment or disposal capacity.

Stratigraphic. Division of geology dealing with the definition and description of rocks and soils, especially sedimentary rocks.

Subcritical experiment. A dynamic experiment that involves the use of special nuclear material and does not achieve a condition of criticality, i.e., no self-sustaining nuclear reaction.

Subsidence. A depression formed at the surface of the ground by an underground nuclear explosion. The dimensions of the subsidence are a function of explosive yield, depth of burial, and geologic site characteristics.

Subsurface. A zone below the surface of the Earth whose geologic features are principally layers of rock that have been tilted or faulted and are interpreted on the basis of drill hole records and geophysical (seismic or rock vibration) evidence. Generally, it is all rock and solid materials lying beneath the Earth's surface.

Sulfur dioxide. A toxic gas that is produced when fossil fuels are burned. Sulfur dioxide is the main pollutant involved in the formation of acid rain. The major source of sulfur dioxide in the United States is coal-burning electric utilities.

Surface ground zero. The location at ground level where the emplacement hole is drilled.

Surficial soils. Soils which occur on the Earth's surface, specifically, the upper 12 to 20 cm of tilled soil.

Tectonic. Of, pertaining to, or designating the rock structure and external forms resulting from the deformation of the earth's crust. As applied to earthquakes, it is used to describe shocks not due to volcanic action or to collapse of caverns or landslides.

Temporal. Limited or finite; related to time rather than space.

Threat-Nuclear-Device Simulants. Radioactive sources which simulate the radioactive character of an unexploded nuclear device.

Threatened species. A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Transmissivity. The rate at which water is passed through a unit width of rock under a unit hydraulic gradient.

Transuranic mixed waste. Waste containing both transuranic and hazardous components, as identified in Title 40 CFR Part 261, Subparts C and D.

Transuranic waste. Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92 and half-lives greater than 20 years, in concentrations greater than 100 nanocuries (nCi) per gram.

Transuranic radionuclide. Any radionuclide having an atomic number greater than 92.

Trip generation. A determination of the quantity of trip ends associated with a parcel of land.

Tritium. A radioactive isotope of the element hydrogen, with two neutrons and one proton in its nucleus. Common symbols for the isotope are H^3 and H-3.

Unemployment rate. The number of civilians, as a percentage of the total civilian labor force, without jobs but actively seeking employment.

Unsaturated Zone. The subsurface zone between the land surface and the top of the groundwater. The unsaturated zone at the NTS is thick, ranging from 106 m (525 ft) to almost 909 m (3,000 ft) in some areas.

Use tax. A tax incurred in those instances when articles purchased in an area where no sales tax is levied are brought back for use in an area where the sales tax is imposed.

Vitrification. A waste treatment process that uses glass (e.g., borosilicate glass) to encapsulate or immobilize radioactive wastes to prevent them from reacting in disposal sites.

Volume (traffic). The total number of vehicles that pass over a given point or section of a roadway during a given time interval. Volumes may be expressed in terms of annual, daily, hourly, or subhourly periods.

Waste acceptance criteria. The requirements specifying the characteristics of waste and waste packaging acceptable to a waste receiving facility and the documents and processes the generator needs to certify that waste meets applicable requirements.

Waste management. The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

- Site - Made up of units that accommodate specific types of waste. The Radioactive Waste Management Sites at Areas 3 and 5 are sites.
- Unit - The seven craters at Area 3, the 20 trench Mixed Waste Disposal Unit, and the low-level waste pits and trenches in the 92 acre active portion of Area 5 are units.
- Crater - An individual disposal cell similar to a trench or pit as U3ah or U3ah/at.
- Trench - The individual disposal cells in the Mixed Waste Disposal Unit, the individual cells for such as TO3U, are trenches.
- Pit - As in Pit 3 (PO3U) is an individual disposal cell similar to a trench.
- Cell - Trenches, Pits, and Craters are all waste management cells.

Waste management facility. All contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of waste.

Watershed. The land area that drains into a stream or river.

Wetlands. An area that is regularly saturated by surface water or groundwater and subsequently supports vegetation that is adopted for life in saturated soil conditions.

Wickiup. A frame hut covered with matting, bark, brush, or the like and used by the nomadic Indians of North America.

Work-for-Others-Program. Reimbursable programs (work) funded by other than DOE Defense Programs, i.e. Department of Defense and Defense Nuclear Agency.

X-ray. Ionizing, electromagnetic radiation emitted from the electron field of an unstable atom. X-rays are similar in nature, but generally lower in energy than gamma rays.

Zeolitized rocks. Various hydrous silicates occurring as secondary minerals in lava matrices and cavities within lavas.

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LIST OF ACRONYMS

AIWS	American Indian Writers Subgroup
amp	ampere
Bd	baud
Bq	Becquerel
Bq/L	Becquerels per liter
BREN	Bare Reactor Experiment Nevada Tower
°C	degree Celsius
C	Coulomb
C/kg	coulomb per kilogram
CFR	Code of Federal Regulations
CGTO	Consolidated Group of Tribes and Organizations
Ci	curie
Ci/yr	curies per year
cm	centimeter
cm^2	square centimeter
dB	decibel
dBA	A-weighted sound levels
DEIS	Draft Environmental Impact Statement
DoD	Department of Defense
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
°F	degree Fahrenheit
FEIS	Final Environmental Impact Statement
ft	feet
ft^2	square feet
ft^3	cubic feet
ft/sec	feet per second
ft/yr	feet per year
g	local acceleration due to gravity
gal	gallon

gal/hr	gallon per hour
gal/s	gallons per second
gal/yr	gallons per year
gpm	gallon per minute
HE	high explosive
HF	high frequency
Hz	hertz
in.	inch
in^2	square inches
in^3	cubic inch
J	joule
kg	kilogram
kg/yr	kilograms per year
km	kilometer
km^2	square kilometer
kph	kilometers per hour
kt	kilotons
kV	kilovolt
kw	kilowatt
L	liter
L/min	liters per minute
L/s	liters per second
lb	pound
lb/yr	pounds per year
m	meter
m^2	square meter
m^3	cubic meter
m/sec	meters per second
m/yr	meters per year
MEI	maximally exposed individuals
MHz	megahertz
μCi	microcurie
μg	microgram
mg	milligram

mg/L	milligram per liter
mg/yr	milligram per year
mi	mile
mi^2	square mile
mm	millimeters
mph	miles per hour
mR	milliroentgen
mrem/hr	millirem per hour
mrem/yr	millirem per year
mW	milliwatt
MW	megawatt
NAFR	Nellis Air Force Range
nCi	nanocurie
ns	nanosecond
NTS	Nevada Test Site
NV/ERP	Nevada Environmental Restoration Program
OCC	Operation Coordinator Center
ppm	parts per million
PCB	polychlorinated biphenyl
pCi/L	picocurie per liter
PEIS	Programmatic Environmental Impact Statement
PM_{10}	airborne particulate matter smaller than 10 micrometers (microns)
R	roentgen
rem	roentgen equivalent man
SHPO	State Historic Preservation Officer
tons/yr	tons per year
TNT	trinitrotoluene
TRU	transuranic
UHF	ultra high frequency
V	volt
w	watt
yd	yard
yd^2	square yard
yd^3	cubic yard

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Measurements and Conversions

The following information is provided to assist the reader in understanding certain concepts in this NTS Environmental Impact Statement (EIS). Definitions of technical terms can be found in the Glossary and names and symbols for units of measure can be found in the Acronym List.

The primary units used in this report are metric units with English equivalents enclosed in parenthesis. DOE Order 5900.2A, "Use of the Metric System of Measurement," prescribes the use of this system in DOE documents.

To signify decimal multiples and submultiples, the following prefixes may be used:

Submultiple	Prefix	Symbol	Multiple	Prefix	Symbol
10^{-2}	centi	c	10^{2}	hecto	h
10^{-3}	milli	m	10^{3}	kilo	k
10^{-6}	micro	μ	10^{6}	mega	M
10^{-9}	nano	n	10^{9}	giga	G
10^{-12}	pico	p	10^{12}	tera	T

The following Conversion Table lists the mathematical values or formulas needed for conversion between metric and English units:

Conversion Table

Multiply	By	To Obtain	Multiply	By	To Obtain
cm	0.3937	in	in	2.5400	cm
m	3.2808	ft	ft	0.3048	m
km	0.6214	mi	mi	1.6093	km
g	0.0353	oz	oz	28.3286	g
kg	2.2046	lb	lb	0.4536	kg
ac-ft	1233.4818	m^3	m^3	0.00081	ac-ft
ac-ft	1612.9032	yd^3	yd^3	0.00062	ac-ft
L	0.2642	gal	gal	3.7853	L
m^2	10.7639	ft^2	ft^2	0.0929	m^2

Multiply	By	To Obtain	Multiply	By	To Obtain
km^2	0.3861	mi^2	mi^2	2.5900	km^2
m^3	35.3145	ft^3	ft^3	0.0283	m^3
m^3	263.1579	gal	gal	0.0038	m^3
pCi	1,000	nCi	nCi	0.001	pCi
μCi/mL	10^9	pCi/L	pCi/L	10^{-9}	μCi/mL
Ci/m^3	10^{12}	pCi/m^3	pCi/m^3	10^{-12}	Ci/m^3
mCi/cm^3	10^{15}	pCi/m^3	pCi/m^3	10^{-15}	mCi/cm^3
nCi/m^2	1.0	mCi/km^2	mCi/km^2	1.0	nCi/m^2
ppm	1,000	ppb	ppb	0.001	ppm
R	$2.58x10^{-4}$	C/kg	C/kg	3876.0	R
mR	1,000	R	R	0.001	mR
Bq	$2.703x10^{-11}$	Ci	Ci	$3.7x10^{10}$	Bq
Bq	1.0	dps	dps	1.0	Bq
Gy	100	rad	rad	0.01	Gy
Sv	100	rem	rem	0.01	Sv
°C	(°C x 9/5) +32	°F	°F	(°F - 32) x 5/9	°C

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